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THE EXPLORATION OF THE SIACHEN OR ROSE GLACIER, EASTERN KARAKORAM.*

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As previously stated in the *Geographical Journal*, near the end of our 1911 expedition Dr. Hunter Workman and I crossed to the Siachen or Rose glacier on August 20, making between that date and September 14 as much of a reconnaissance of its basin as the short days, variable weather, and glacial conditions of the advanced season would admit of.

In the time passed there I became fully alive to the obstacles which would beset one attempting, even with eight summer weeks at disposal, to explore its salient points and to carry out a fairly thorough survey of the main glacier and its affluents. Those who, like ourselves, have tried to investigate glaciers such as the Hispar and Baltoro, both of which may be ascended from their tongues, will appreciate the difficulty of visiting in its entirety a 46-mile-long glacier with a useless tongue. I say "useless tongue," because, as is known, the upper Nubra valley leading to that tongue is void of supplies for more than a handful of men, and, worse than this, the Siachen tongue cannot be reached at all between May and September 15, owing to the volume of water and to the presence of quicksands in the Nubra river, which render its traverse at different fording-points absolutely dangerous to life.

Hence, the exploration of the Rose glacier resolves itself at once into solving the problem of a last base at Goma in the Saltoro valley, which is

* Royal Geographical Society, November 24, 1913. A paper by Dr. Hunter Workman read at the same meeting will be published in a later number of the *Journal*. Map, p. 232.

separated from the Rose * by the 10-mile Ghyari nala, the 13-mile-long difficult Bilaphond glacier, the passage of the 18,400-foot Bilaphond La and the descent of the 7-mile-long Lolophond glacier.

When you have performed this little feat you are there and have tapped the Siachen at about 16,000 feet, where you may next make a new receiving base for the hundreds of maunds of flour, stores, sheep, and even wood required by a large contingent of men for several weeks. "No, I won't come again," I said as I sat snowed in in my tent for two days before crossing the Bilaphond La in September, 1911. But no sooner had I turned my back to the Rose and reached the top of the pass on that brilliant September morning, than my mountain ego re-asserted itself, saying *tant pis* to the obstacles, return you must.

And thus April, 1912, again found us in Srinagar. Through the kind assistance of Mr. E. A. Reeves, F.R.A.S., I had secured the services of Mr. C. Grant Peterkin, diploma-holder of the R.G.S., as surveyor. Col. S. G. Burrard, C.S.I., R.E., Surveyor-General of India, most kindly loaned me a native plane-tabler, Sarjan Singh of Party I. Indian Survey, to assist Mr. Peterkin. I have also to express my thanks to Col. Burrard for the loan of theodolite, plane-tables, chronometer watch, and other instruments, and to the Royal Geographical Society for the loan of plane-table and other instruments. Major Pirrie in charge of Party I. selected Surjan Singh for the work, saw that instruments were ready, and did all in his power to further the interests of the expedition. I have to thank Mr. Stuart Fraser, C.S.I., Resident in Kashmir, for assisting the expedition in every way he could. I took again T. Byramji of Srinagar as transport agent and collector of grain and coolies at Kapalu and Goma. Two reservist orderlies from the Indian Army, Pindi Division, assisted this work by accompanying coolie-caravans to and from the Goma base. Cyprien Savoye of Pré St. Didier accompanied Dr. Hunter Workman and myself as head guide, as well as three Italian porters, and a fourth porter was attached to Mr. Peterkin's party.

We left Sringaar June 5, Mr. Peterkin preceding us by about two weeks, for Baltistan. Kapalu is situated on the lower Shyok river, and has for its nominal ruler a jagadar or small Raja. Raja Shere Ali Khan, an intelligent, charming man who assisted us greatly in 1911, had died, and was succeeded by his nephew, Nasir Ali Khan. The Raja gave me our old headman, Wazir Abdul Karim, a hardy, amiable little man, who hung to our camp from start to finish, always working on our side, trying his best to lead the coolies and prevent their absconding in batches, which at times they elected to do. He was certainly the best of the Raja's retainers with whom we had to do.

Four marches from Kapalu brought us to Goma, the last village of the Saltoro valley. From Goma, July 2, we ascended the Ghyari nala to the

* I use both names, Rose and Siachen, for this glacier.

maidan at the tongue of the Bilaphond glacier. This glacier was first ascended for 6 miles by Vigne, in 1835, and again by Dr. Longstaff in 1909, in his search for the Saltoro pass. It is not well to attach too much importance to native names for glaciers given by coolies, and, as Sir Martin Conway said at one of our lectures before the Royal Geographical Society, "it is difficult indeed to place much reliance upon such names." This is particularly true when making rapid journeys through a region where one is forced to accept names given by any coolie who is at hand. But when one goes, as I did, with the idea of securing data for a map that would stand, it is necessary to inquire into the traditions of a name, and, so far as the meagre opportunities offer, get at the meaning it conveys to the zemindar's mind. As the nomenclature of this glacier and of the pass at its head is of no mean importance to the future geography of this region, I must expand somewhat on the two subjects.

When, in 1911, we inquired through our polyglot Parsee agent of the zemindars or coolies what they called this glacier, one and all said Bilapho, and spelled it without the "nd." They said the word was a Balti one, meaning a small bright-coloured butterfly. Not satisfied with this explanation, I told the agent in 1912 he must go further into the question of this name and consult the mullahs and oldest inhabitants. It happened that several intelligent native settlement officers, whose business it is to get at the meaning of local names, were in the Saltoro valley, and they and the Parsee went carefully into the matter, with the following conclusion—*i.e.* that Bilaphond so spelt, but the "d" not sounded, in Balti, means butterfly; that the reason for giving the glacier the name was, not because butterflies were seen on it, as had been said by the coolies, but that in former days this name was given because of the shape the glacier assumes at Naram, 6 miles from its tongue. The main glacier running south towards Ghyari and north towards the pass forming the trunk or body of the butterfly, and the branch entering east which descends from behind Peak 8 and the one entering west forming the wings, hence completing to the Eastern eye the image of a butterfly. This definition of the meaning of the name Bilaphond presupposes an intelligence and poetic imagination not to be found among Saltoro people of to-day. Perhaps in the old time, when, according to the "legend of the Siachen," the Ghyari nala was thickly populated to the foot of the glacier, a select few lived capable of such flights of imagination. At any rate, they have handed it down to their descendants, and it is pleasant to record such a poetic and also fitting reason for the naming of the Butterfly glacier.

Regarding the Saltoro pass, which Sir Francis Younghusband sought for from Chinese Turkestan, many miles north, and which Dr. Longstaff claims to have found when he stood on the Bilaphond La, in my humble opinion, this pass, if it exists, is still undiscovered. Dr. Longstaff says "tradition and usage have given the name Saltoro to the pass," but he admits that locally it is called Bilaphond La. Now the Bilaphond La is

separated from the Saltoro valley by the Ghyari nala and the Bilaphond glacier, and bears no relation to that valley. So far as I could learn from the so-called learned men of the region, who are possessed of whatever saga connected with it that has been handed down, it is, and always has been, called by the people Bilaphond La. In the legend, of which I shall speak elsewhere, old time Baltis referred to the Yarkandis crossing the Bilaphond La when they came to "loot" in the Ghyari nala. When Vigne, in 1835, ascended the Saltoro valley in search of a route to Nubra, he was told by the natives "that he would cross a pass, and descend, after crossing a glacier, upon the northern end of the Nubra valley." This he tried and failed to do. But nowhere that I can discover in his writings does he use the name "Saltoro pass." Neither have I been able to find in the writings of Thomson, Strachey, and Moorcroft, mention of the word "Saltoro" as applied to any pass. I cannot, therefore, agree with Dr. Longstaff that "usage and tradition" have given the name "Saltoro" to the pass at the head of the Bilaphond glacier. Thus, considering the name Bilaphond to be correct, both in local usage and as designating its geographical position, I have elected to have it so called on my map. The name chosen accords with the advice given explorers by the Royal Geographical Society to select, when naming glaciers or peaks, if possible, names known to natives of the region. It is not my habit to attempt to change either spelling or names existing on previous maps, but in this case I regard myself as quite justified in not adopting the word "Saltoro" as employed on Dr. Longstaff's sketch-map.

This being a historical and geographical narrative, I will not describe this glacier, but may remark *en passant*, that, judging from the appearance of its tongue, it was in both 1911 and 1912 advancing slightly. In both years, it was found a most tiresome glacier to negotiate from the condition of its huge jumble of rickety moraines which extend from side to side of its boundary walls. Locomotion by continual "moraine hopping," aptly so called by Major the Honble. C. G. Bruce, is continued to a mile beyond Naram, the first camping-ground 6 miles up the glacier. From here the ascent, by ice-bands running between median moraines, is easy to below Ali Bransa.

In 1911 we had no trouble in finding this last station before the pass, but the following July a heavy snowstorm overtook us, and it was difficult to spot the small moraine-ridge where it is situated, this being above an ascending area of crevasses which were not easy to handle in the blinding snow. It is at about 17,000 feet, and is separated enough from the high border-cliffs to be safe from falling stones. In 1911 eight native stone shelters were found there, which showed no signs of fires or of recent usage, and may have been standing in this protected place for a century. Neither Vigne nor Dr. Longstaff appear to have actually visited the place. The shelters have now been greatly demolished by the different parties of our expeditions, who constantly bivouacked here on their way to and from the

Siachen with supplies. For several reasons it clings to my memory as the most gruesome camp of my Rose glacier experiences, and, when we finally left it to cross to the Rose glacier in 1912, my mind was made up never to return thither could I find another road back. Coming directly from grass, the altitude is felt and the cold also in bad weather. We had a sixteen-hours snowstorm here, and, when it cleared, had to wait two days for a belated caravan of supplies. The minimum temperature on two nights was 16° Fahr. When the sun shines the heat is intense during the day; a black-bulb thermometer reading gave 197° Fahr. at 12.30 noon. After four nights, thinking to have shaken off Ali Bransa, we left on a cloudless day for the Bilaphond pass. An hour from camp, as the route was easy, I gave guide Savoye the order to cross the pass with the second guide and look up a route to a peak I wished to climb, and then rejoin us on the far side of the pass. Two porters remained with our caravan. Soon after, Cesare Chenoz, through his own carelessness, fell into a crevasse 80 feet deep. Although brought out alive and carried back to Ali Bransa, where every care was given him, he died the same night from the effects of cold and shock.

Three days later, after the burial of Chenoz, we again left Ali Bransa with a file of ninety coolies. The weather, as it had been for eight days, was glorious, when, for the third time in eleven months, we arrived on the summit of the Bilaphond La. This saddle was measured by Dr. Longstaff by aneroid at 18,200 feet. The mean of hypsometric readings taken by us in 1911 and 1912, and by Mr. Peterkin, give a height of 18,370 feet. The salient object of interest from the pass is the distant Rose glacier seen flowing southward, past the entrance of the large glacier which descends from the Bilaphond La and which we have named the Lolophond. Coolies coming and going from Goma arranged a camping-ground on the left moraine of this glacier which they called Lolophond. The width of the Siachen is 2¾ miles at entrance of the Lolophond, but, owing to foreshortening, such a width is not suspected from the pass. The largest Siachen east affluent is seen entering on its far side, curling gracefully around a bold rock promontory and continuing its way south-eastward with the Siachen, in tangled mazes of séracs and crevasses. To the east of the pass the Bilaphond peak rises, and to the west the summit of Peak 36, height 25,400 feet, towers above the mountains forming the Bilaphond wall. This latter peak, an object of great scenic effect elsewhere, here makes itself known only as a well-fixed survey point to aid the topographer.

A peak which I am about to mention, strikes the eye north, being one of the landmarks of the Bilaphond La. I had selected this mountain as offering a probable fine point of view in 1911, but the weather when we were in its vicinity was unfavourable for its ascent. If it were ever to be climbed this seemed to be the opportunity. The caravan was accordingly divided, the supply one continuing on to Lolophond, while we with a

smaller one, leaving the pass, descended north to a snow hollow, from which a steep, furrowed slope led us to a large plateau where camp was pitched in the snow at 19,000 feet. The next day more slopes were ascended to a rock ridge jutting out below the main peak. Here Dr. Hunter Workman set up his cameras and instruments and remained at 19,900 feet while I continued upward with three guides. It was a rather difficult climb, the middle part being decidedly precarious owing to the melting of the snow, through which we sank on to hard black ice, which necessitated constant step-cutting. On the last 200 feet the snow was deeper and more stable. The gradient was from 45° to 60°.

I saw many interesting things from this summit which aided me in the later work on the Rose glacier. Perhaps the finest was the double summitted Peak 35–36, which loomed directly south-west. This mountain was formerly called Karakoram No. 3 and 4 in 'Synoptical,' vol. 7, but at present its most up-to-date survey symbol is $\frac{\text{Pk. } 35}{25\text{A}}$ and $\frac{\text{Pk. } 36}{52\text{A}}$. I substantiated one special point also in connection with it. The snow-basin on the north side, much foreshortened in the photograph, is flanked by the unscalable boundary-wall rising between the Dong-Dong glacier, which lies directly behind, and the west Siachen affluent, which we have named Peak 36 glacier. We visited the Dong-Dong wall in 1911, and there exists no passage over the watershed between the Dong-Dong and the Siachen glacier affluent.

The most interesting peak I was able to secure with my small camera was probably the high one which we later discovered from the north-east Siachen source on the Turkestan side. The only Baltoro peak I could identify was the flat-topped Bride peak west of the Rose glacier. I named my new mountain the Tawiz peak, as it overlooks the Bilaphond La, where, according to the legend, in olden days the Baltis placed the Tawiz (magic) destined to bring about their revenge on the Yarkandis of the fabled city of Tarim Shehr. Its height measured by hypsometer is 21,000 feet. That night at camp on the plateau a minimum temperature of 3° Fahr. was noted. The next day we descended to the Rose glacier by the left Lolophond side, which we found both years to be the most feasible route.

The Siachen glacier is situated between lat. 35° 11′ 20″ and 35° 43′ 30″ N. and long. 76° 45′ and 77° 17′ 30″ E. It was first seen by Col. Henry Strachey, when, in October, 1848, he ascended it from its tongue for 2 miles. In 1909, Dr. Longstaff first crossed the Bilaphond La and discovered that the Siachen extended further north than had been supposed. It was thought by Thomson and Strachey, I believe, to end in a mountain wall about 20 miles from its tongue, and the Survey map gives it that length approximately. Dr. Longstaff visited its basin in 1909, remaining one day taking angles with clinometer to various peaks, and the same autumn ascended it from its tongue for about 10 miles. This was all that was known of the great glacier until 1911, when, as first stated, Dr. Workman

and I made a reconnaissance of its basin and explored two of its largest affluents. In 1912 my expedition first properly explored the glacier from end to end, discovered and ascended to its north and east sources, and established the relation of the eastern Karakoram-Indus watershed to that of Chinese Turkestan at those points. All of its chief affluents were examined and these and the main stream surveyed and mapped. Most of its important mountains also were triangulated. The glacier is 46 miles long, and its width for some 25 miles varies from 2½ to 2¾ miles. It is without question the longest and largest valley glacier in Asia, probably in the world, excepting those of the Polar regions. According to Dr. Merzbacher, the Inyltchek, the longest glacier in the Tian Shan, has a length of 65 kilom. or 40 miles and a width of 2 to 4 kilom., 2½ miles.

So far as I can learn after much inquiry, the meaning of Siachen is literally rose-bush. *Sia* is the Balti name for jungle rose, and *chen* means a collection of thorns. Such wild rose-bushes are prevalent in the nalas, and flourish in pink and white splendour to the tongues of the glaciers in this part of Baltistan. From Dr. Thomas, the Tibetan scholar, I learn that the Tibetan Se-ba-can means "having rose-bushes," so probably the Balti meaning is derived from the Tibetan. As is well known, Baltistan was subject to Tibet in the eighth century. Siachen, when correctly spoken, is guttural, and requires an effort to pronounce, and to my taste the English name Rose glacier is quite as appropriate. Its very incongruity as applied to this huge ice-sheet pleases the fancy. On many glaciers the jungle rose is found on mountain flanks well above the snouts, but on the lower Siachen flanks one is fortunate to find stunted edelweiss and other small Alpine flora, while on the route of its upper 30 miles only snow roses thrive. Ice formations resembling roses I noticed in some of its chasms.

In 1911 we made a base camp on the Tarim Shehr promontory. After the first 14 miles from the Siachen tongue, this is the only place in 33 miles where grass and burtsa for fuel are found. On Dr. Longstaff's sketch-map it is indicated as a nunatak, which perhaps it once was, but on near approach it is found to be a large granite and shale promontory descending from the slate peaks forming the barrier between the Rose and the east or Tarim Sehr affluent. The lowest point where it touches the Rose glacier is 15,670 feet, and directly overtopping it here is a slate peak, height 20,840 feet, which we climbed in 1911, and named Junction Peak. At the point where Junction Peak shades off into a gentle slope a good-sized offshoot of the Tarim Shehr glacier bears down upon the promontory in a tongue of white séracs. Below this are several acres of grass hillocks watered by glacier streams. Here any number of grass camps can be made in July and August, and here we found a stone circle 12 feet in diameter made at one time by natives. The stones, which were covered with lichens, had evidently lain untouched for years. No shelters such as were seen at Ali Bransa were found. Inside

the circle, large ibex horns attached to the skulls were piled up, certainly by human hands, and these were decayed and old, falling apart in shreds when touched. No carcasses were seen outside the circle, but the place was strewn with ibex horns, apparently from animals that had died or been killed by wolves or snow leopards. In other places the footprints of foxes and of some other animal which we failed to recognize, were observed. Large ram chikor flew out from the rocks when disturbed by footsteps, and there were a fair number of very small grey birds about in early September, which the guides called snow birds, being exactly like those found in the Italian Alps. Examples of bird-life are scarce on the high Siachen, and those existing seem to make their home here at the last grass.

From the above-mentioned hillock-area a large torrent may be crossed and half a mile of slopes ascended to another rolling, much larger, grass-area, nestling in the hollows of which in 1911 we found two good-sized lakes. Here we made another camp in 1911 at 16,300 feet. Large ibex were seen daily here grazing. This part of the Tarim Shehr promontory is bounded on the north and south sides by bare shale and granite head-lands which rise abruptly from the glacier. Even on these rocky eminences rising to 800 feet above the second grass-area, tiny maidans for tents may be found now and again. This is a unique spot in the heart of this ice world, surrounded on all sides by miles of glaciers and ice-girt peaks, and may well be named Tarim Shehr, or "last oasis." Thus spelled Shehr in Persian means "city," and in the legend furnished me by the "learned men," there was supposed to be an ancient city here inhabited by Yarkandis. Here also the Baltis are said to have played polo with the Yarkandis, who from here went to the Ghyari nala to loot the cattle of the Balti villagers. Further, the legend explains why the ancient city was reduced to its present desolate and rock-strewn state.

On one occasion the Yarkandis kidnapped a Balti woman working in a field of a Ghyari village. An important Mullah, Hazrat Ameer, was in the village at the time, and he gave the enraged Baltis a Tawiz amulet, telling them to put it on the top of the Bilaphond pass, and to return to their village *viâ* Yarkand. The Baltis having done the first part, disobeyed the priest, and returned the same way, by the pass, home. However, soon after a great storm visited Tarim Shehr, "and the snow from the mountains slipped and fell upon the city," destroying it and its people, including those who had stolen the woman. Curiously, when first on the Rose glacier, the coolies never mentioned the place to us, and it was only when I spoke to my cook about going to the promontory that he said, "Oh yes; the coolies call that 'Teram Shehr,' and say it is a nice home with much grass." How they knew of it is one of those native mysteries one cannot solve. Dr. Longstaff did not visit the place, and, under all circumstances, it is hard to reach, owing to the broken condition of the Siachen for a

VIEW TAKEN FROM THE SILVER THRONE PLATEAU AT 20,600 FEET, SHOWING QUEEN MARY PEAK, MOUNT HARDINGE, AND THE PRECIPITOUS WALLS ENCLOSING HEAD OF NORTH-EAST KONDUS GLACIER.

THE SOURCE OF THE NORTH-EAST KONDUS GLACIER, THE GUSHERBRUMS, PEAK 23, AND ARÊTE OF QUEEN MARY PEAK IN BACKGROUND.

THE TERAM KANGRI FROM THE WEST SIDE OF THE ROSE GLACIER.

PEAKS 35 AND 36 AND RIDGE SEPARATING DONG DONG GLACIER FROM PEAK 36 GLACIER.

SUMMIT OF TAWIZ PEAK, 21,000 FEET, FIRST ASCENDED BY F. BULLOCK WORKMAN AND GUIDES IN 1912.

mile this side of it, and because of the numberless glacier-rivers to be forded. None of our coolies allowed that they had seen the place, and none certainly had been there before we led them to it, yet they had a name for it and said it was a good camping-ground. Beyond this, not a suggestion of a name for a spot above or below on the glacier was obtainable from our Baltis.

Regarding the term "Tarim," which I have adopted, I would say that neither experts in Tibetan, Persian, or Arabic, have been able to tell me of the existence of the word "Teram." The best informed persons of the Kapalu and Saltoro districts had no knowledge of such a word in the Balti language. As Tarim is used in Chinese Turkestan for cultivated area or oasis it is possible, as Sir Aurel Stein suggests, that the Baltis may have heard of it in connection with the Tarim basin or Yarkand as applied to the country beyond their frontier, and by usage easily have perverted it into Teram which they applied to Tarim Shehr. Anyhow, it seems best to adopt a term the meaning of which applies in a general way to the Tarim Shehr promontory, for that and the large east affluent, rather than to coin one for which no authority appears to exist. At Tarim Shehr three solid cairns marked B.W. in black were placed at different points, and one at our camp at 18,400 feet on Junction mountain.

On September 8, 1911, temperature 22° Fahr., we left the promontory to examine the Tarim Shehr glacier, striking it above the entrance into the Rose glacier. After five hours of easy slate and shale moraines came badly broken up granite ones, which so slackened the caravan's progress that camp had to be made on moraine at 17,500 feet. After a very cold night we continued up the glacier-surface, which in one hour became soft from the sun's heat. The whole route was dotted with snow-covered water-pools, into which to the knees one was constantly breaking. This zone ended, the gradient became much steeper. Seen from the Rose this glacier appears to rise gradually for miles, but in reality its higher part in 1911 was composed of three slopes broken by short snow terraces, and the whole area was distorted by transverse crevasses of a size and depth not met with on the Rose or its other large branches. A wide plateau was finally reached lying at over 18,000 feet. This white sea is riven with crevasses running in all directions. Leading the caravan cautiously in and out of this maze, we advanced until the guide said the risk was too great, as the caravan might at any moment become engulfed in this vortex of great bottomless chasms. From where we stood at 18,500 feet, the plateau imperceptibly rises to what looks like a snow depression on the north side of the east end. The passage, if there is one, would be by this narrow yoke. Should a descent on the further side be practicable, the head of one of the glaciers of the Remo system might be reached, and a route to the Shyok valley be found. We considered well before turning back here, but at last decided the risk was too great, of camping the caravan at 18,500 feet for two nights in the September cold, that year

very severe at night, particularly as the chance of our overcoming with the guide the 6 miles of crevasses leading to the col the next day was an uncertain quantity. The Tarim Shehr glacier is 17 miles long from its entrance into the Rose, and averages a width of 1½ to 2 miles before emerging into its reservoir basin. Peaks from 21,000 to 23,000 feet form its north and south boundary walls, and two of about 22,000 feet rise as isolated points from its reservoir-plateau.

In 1912 the Siachen sources first claimed our attention. When recalled from the lower Siachen my intention was to make a second attempt to reach the Tarim Shehr glacier source, but several reasons interfered. That glacier looked quite as impossible in its upper trend, as in the previous September. Provisions and coolie patience were at a low ebb, and ten days of fog came to hold us captive on the higher Rose. Finally, events worked together to make it a question of forcing a new passage at the Rose glacier west source-head or of attempting to reach the Tarim Shehr col, which, if reached, might be found to be a passage to some other glacier. Both could not be accomplished by my expedition that season. I had just the force of men and provisions necessary for returning by unknown ground to Baltistan, but not that needed to descend a new glacier east of Tarim Shehr, which it would be desirable to do if one existed, and wander down to somewhere in the Shyok valley, where most likely my caravan would find no supplies; and, as things turned out, I chose, wisely, I think, to do the former. If Dr. de Filippi's expedition explores the Remo glaciers to their heads, it will doubtless ascertain whether or not a pass leads from any of them to the Rose glacier.

I will next mention the Teram Kangri. This massif-like ridge culminating in several peaks rising from the Siachen basin and forming part of the east boundary wall, 18 miles from the north water-parting, was first seen by Dr. Longstaff from the Bilaphond La in 1909. During his day's visit to the Siachen he measured by clinometer three summits of the group, giving on his sketch-map later the height of 27,610 feet to the highest, called by him Teram Kangri. The apparent discovery of a very high peak in the eastern Karakoram created considerable interest in the geographical and Alpine world. In 1911 the Indian Survey sent Mr. Collins of the Survey to the Nubra valley, and from several high stations he triangulated the highest and lowest of the three summits with altitude results of 24,489 feet and 24,218 feet. That same season our topographer, Dr. C. Calciati, during a short visit to the Siachen triangulated the peak east of the one measured by the Indian Survey as the highest, for which he obtained a value of 24,793 feet, or 7559 metres. This he regarded as the highest summit.

In 1912 Mr. Grant Peterkin triangulated all three peaks of this group with results of 24,510 feet, 24,300 feet, and 24,240 feet being obtained for altitude. His observations show the middle peak to be the highest, corresponding thus with the result obtained by the Indian Survey, although

the value obtained for its height is somewhat greater. This ridge of peaks when seen from the Bilaphond La makes no extraordinary impression upon the observer, and I wonder that Dr. Longstaff should have selected these summits as being of unusual height. While prominent, the peaks of this ridge in their relation to the Rose glacier, are of quite secondary importance to the King George V. group at the source of this glacier and to Peaks 35 and 36 to the south-west. With the work done by the Survey and by my 1912 expedition, they may now be said to be triangulated fairly accurately for height.

Our visit to the Peak 36 glacier and ascent on Peak 36 itself to 20,000 feet, as well as some other points investigated, are on account of space omitted from this paper. As crossing the Rose to Tarim Shehr necessitated the fording of many glacier-rivers and finding a way through several intricate belts of séracs which might prove hazardous to coolies going and coming under native leaders, we gave it up in 1912 as a grain-base, using it only to procure burtsa for fuel and to harbour sheep. A higher base for collecting supplies was made on a Siachen moraine at 16,400 feet, and placed in care of a Srinagar babu. The gradient of the Siachen in a distance of 12 miles upward from Tarim Shehr is easy, showing a rise of 1442 feet, or one foot in 43. The best route is along the east side by bands of shaly median moraines. The camping is not much better than upon snow, for where the moraines do not rise in high, undulating hillocks, the surface-covering is sparse, and tents stand practically on thinly covered ice. These miles of moraines, strewn with blocks of marble and other *débris*, are very interesting, but do not come into the scope of this paper, and will be described elsewhere.

On July 18 we left one of these moraine camps at 17,000 feet for an attempt to reach the Siachen north source. Passing the last west affluent, which enters above the Peak 36 glacier, we continued up the Rose, which here takes on a sharper gradient and narrows somewhat. By 3 p.m crevasses and soft snow made advance so slow that camp had to be pitched in the middle of the glacier, 18,050 feet. The weather seemed uncertain at evening, and the next morning we found the tents laden with snow and a heavy storm in progress. When escape is possible there is no use waiting about under such conditions, so we packed up and descended in a dense mist for three hours with snow cutting our faces like a knife. Camp was made on snow-covered moraine at 17,200 feet. Luck was not yet ours, and that night the elements raged again and continued to do so for two days more. When the clouds broke a little the third day, but with a bad wind holding and four feet of new snow now lying on the higher glacier, as provisions were low we marched down to a mountain-*arête* to await favourable skies. From this perch at 16,770 feet for one day before the snow melted, the Siachen stretched above and below us like a great snow-sea, not a crevasse or rock being visible. Then the magic sea vanished and out cropped the crevasses, rocks, and

normal glacier-features, and with them came a change of wind which set us to hoping. Lastly, our three mascots appeared on the scene and began to caw loudly. I would mention that three crows had followed the camp from Ali Bransa, and continued to accompany us to the sources and to all camps to the Kondus tongue. They were not even distinguished by red beaks as are mountain choughs, but were well-nourished crows of good size, which took care to find a living off the camp, and did not suffer for five minutes from mountain lassitude even at over 20,000 feet.

After this delay, on July 25, a second start was made and we camped again on the end of a moraine at 17,200 feet. The next day we pushed on a good distance above the previous glacier-camp to a high shale ridge which juts into the glacier from the east side. About 200 feet above the glacier near the base of this ridge a small rocky spur was discovered for camp. Circling the base of the spur on all but one side was a deep blue lakelet encased in white ice-walls. Tent terraces were constructed amid the rock-chaos, and we thought ourselves fortunate to find such good quarters on soil near the Siachen head at 18,400 feet. A highly interesting find was made here—the lower layers or remains of two native stone cairns. They were nearly demolished, but it was quite plain that only human hands could have placed the rocks as we found them.

On July 27, temperature 15° Fahr., we left Spur camp and descended to the glacier. The ridge of the east wall, before spoken of, upon which the camp was located, projects into the glacier for some distance, thus causing a narrowing in of the Rose before it reaches its upper basin. After contouring this we ascended sharp, crevassed slopes for 1½ hours before reaching a large plateau. From this basin west rises a low snow mountain, and beyond it the high precipitous walls of the King George V. group which close the Rose glacier in an impenetrable barrier. Although high enough in themselves, these are really only lower walls of the group, which dominates in four high peaks the north-west head of the Rose glacier. Neither Peak 23 nor its satellites are seen from this point. From the east side of the plateau gentle slopes rose toward an apparent, but from here invisible, col. But this was not in that day's work, so we continued north over rising hillocks and slants which became most wearisome as the snow softened, letting us in to the knees at about every step. There was nothing to guide us, but after consultation we headed toward a snow peak of probably 22,000 feet, which apparently stood at the end of everything. On the west or left we passed the snow gap with a bergschrund at its base, that is seen for 30 miles down the glacier, which Dr. Longstaff noticed when he reached the Siachen, and which he says "he connected at once with the sketch of Younghusband's Saltoro pass," which he had seen in his report. This gap is what I suppose Dr. Longstaff refers to as Younghusband's saddle and designates by that name on his sketch-map. The gap is, however, no pass, and bears no relation to the real water-

parting ridge, which latter is not seen at all from any point of the Rose glacier. It is a narrow connecting link between some peaks of the intricate Siachen reservoir, merely an idiosyncrasy of nature, thrown in to mislead any one casually looking up from the middle Siachen. Beyond this false col is a deep snow-basin.

Leaving this point a mile or so behind, we came to a peak the east shoulder of which gave us a sharp bit of climbing. By this time we were well out of sight of the main Siachen reservoir, and after a descent continued along a previously unseen high snow-field. The whole *trajet* in the deep soft snow was exhausting, and we were relieved when upon contouring a reach of gaping crevasses the ridge was at last approached and distant peaks, rising from beyond a void, came into view. The guide, stepping ahead, called out, "Slowly, we must rope; it is a line of huge cornices." And so it was, not one, but rows of them, extending right across the ridge to the base of a sharp peak which forms the east boundary of this water-parting. We went as near the edge as possible, and saw these monsters curling over in great white hoods, fringed with massive pendants of ice. Below these fell a perpendicular snow-wall 5000 to 6000 feet to a basin. Bounding this basin was a long splintered rock-ridge which, as could be seen, formed a wall near one head of a large glacier flowing down north-north-east into the verdureless barren region of Chinese Turkestan. Besides the source above which we stood, this glacier had another, plainly seen, to the west on the flanks of the Gusherbrum range. From the latter, the glacier at first descends in chaotic ice-falls.

At the moment of arrival on the ridge we saw three tremendous rock-peaks piercing the clouds to the north-west, beyond doubt from position and appearance the Gusherbrums, but before the camera could be used their tips were lost in cloud. The continuing walls of the Gusherbrums, of which we saw all except a small corner, joins that of Peak 23. The rounded snow elevations seen at the west of the watershed col, running in intricate lines east and west, form a part of the very long but continuous east *arête* of Peak 23. Hence, the Rose glacier may be said to find its main source in the King George V. group, while the east *arête* of Peak 23 itself descends to the col and builds this part of the water-parting between the Indus and Chinese Turkestan. From here the watershed turns south-east and follows the north-east Siachen wall for 14 miles, beyond which we could not with certainty trace it, but it apparently is formed by the remainder of the wall extending to the head of the Tarim Shehr glacier.

A triangular mountain massif, the beginning of which is seen in the illustration, runs south-east from this Turkestan glacier and forms, from what we saw from the east col, the barrier wall between the glacier here spoken of and another large glacier which we discovered from the east col. The glacier here seen is different from those I have met with on the Karakoram side. As may be observed, grey moraines, and they are high ones,

descend through its middle, and they run thus a long way toward the tongue. The ice encasing the moraines on either side was composed of lines of tall pyramid and wedge-shaped white pinnacles, and nowhere were crevassed ice-bands to be detected. My impression was that the glacier could be ascended nearly to its source by a moraine route. From my own observations and after consultation with Sir Francis Younghusband, I judge this to be the Gusherbrum glacier, the tongue of which he visited in 1889. I am glad that we have been privileged to see and photograph it from above one of its sources, and to have aided Indian geography by definitely fixing this important Eastern Karakoram water-parting. The watershed-ridge measured by us with hypsometer works out for height at 20,860 feet after comparison with lower station readings taken three times daily at Skardu. I have named this ridge the Indira col. The only other explorers met with here were a dainty brown butterfly and a large sluggish wasp. The latter greeted us amicably and seemed content to sit for five minutes at a time on the point of my ice axe. There was a high wind blowing, which had perhaps wafted them up to meet us from Kashgar. The thermometer registered 50° Fahr. when we left to descend to our distant camp.

We next day investigated the east Rose source, returning first to the high plateau and then, turning east, ascended by easy slopes in two and a half hours to a snow saddle. This col lies at the base of a long shale mountain-*arête* upon which, if necessary, tents could be placed on rock. It was of interest to note that, on this most forbidding of glaciers for tent-nomads, at one of its heads a dry camping spot may be found. The saddle measured by hypsometer is 19,210 feet. The first thing that impresses the visitor here is the grand group of high peaks looming up as in the photograph, a little to the south behind the east Siachen wall, on the Turkestan side. They are lofty, wild, and complex, rising from intricate snow valleys and elevated plateaux. They have not been placed on any previous map, and were evidently here seen for the first time. The col we stood on, seen in the view, forms a semicircle and ends in the bergschrund-festooned wall visible in foreground of the peaks. Directly below the col a sharp drop occurs, of say 2000 feet. Below, this wall shades off into a short crevassed glacier, which, as an affluent, joins a wide trunk-glacier flowing north-west towards its tongue. We saw well only the upper part rising south-east towards its source behind the group of peaks above mentioned. From the edge of the col the end of the triangular mountain-mass discovered from the Indira col was seen, and the main glacier appeared to take its downward direction along the base of these mountains.

It is probable that this large glacier flowing north-west joins the Gusherbrum stream seen from the Indira col beyond the triangular mountain range, or that both end in the same valley near together. The lat. 35° 41′ 20″ of the point reached by Sir F. Younghusband on the

Urdok glacier would about correspond with that of this col. After consultation with him there appears to be but one conclusion possible—that this is the glacier he ascended in 1889 in search of the Saltoro pass and named the Urdok. The col he saw culminating the Urdok is probably a ridge of the mountain group seen by us from the east Siachen col. This "Younghusband saddle" at head of the Urdok glacier could not lead to the Siachen, as on the east Siachen wall above Tarim Shehr there is no break or possible pass. This east col, therefore, is another and more easterly point on the watershed-ridge towards the Turkestan side, which, with the north one, makes two, which I think I may, with my *confrère* in exploration, justly claim to have discovered and first visited. I have called it the Turkestan La on the map, because under proper European leadership it could be crossed with difficulty by coolies up to August 1 in ordinary seasons. But, in my opinion, it could never have been employed as a passage by Kashgar people to Baltistan or Nubra for two reasons. First, it would be fraught by too many mountaineering obstacles to be used as a caravan route by natives of Turkestan. Second, not being the culmination of a main artery, it would be observed by them only as a ridge at the top of a branch of the Urdok, which it would not occur to them to explore. Here, there is no obvious route such as exists from Nagar over the Hispar pass to Baltistan, for example. In some isolated case a party may have been driven by circumstances from Baltistan or Nubra to seek a way out to Turkestan, and on ascending to the Siachen reservoir found an exit here. This, if accomplished only once, would account for the cairn remains found at Spur camp.

Another explanation of the Spur camp cairns may be sought in the possibility of Nubra or Goma people having penetrated that far up glacier in search of a pass, and, not liking the appearance of the snow-wastes above, having returned down the Siachen. This might also account for the stone circle at Tarim Shehr. But I fear no light can be shed on the matter, certainly not in the Saltoro valley, and, from what I have heard from persons who have inquired in Nubra, the people there appear to have no knowledge of the Rose glacier.

One may weave what romance one will about the cairn-remains near the Rose glacier source, but I think what we saw at the north and east points of the water-parting demonstrates pretty conclusively that no caravan route for either laden animals or men has ever existed there. Sir F. Younghusband tells me that a sportsman with a few natives of Kashgar thinks he crossed the water-parting somewhere in this region ten years ago. He could not, however, remember being on a large glacier during his journey, nor give any details pointing to the route traversed, and only recalled Kiris in the Shyok valley as the first village he reached. At any rate, it is quite certain that he did not cross by the north, north-east, or west Siachen sources.

During these days a white mist hung over the mountains and about

the Siachen, which proved disastrous to photography. It was cold at night and very hot after 11 a.m. On the col described, the glass stood at 32° Fahr. at 9 a.m., and at noon a black-bulb thermometer reading of 200° Fahr. was noted. The weather still holding fair, we at once started for the west Siachen head lying above the last west affluent. Before leaving Spur camp a large cairn was built and marked B.W. in black with the date. Descending the Rose glacier by the same route for a time, we crossed later to the west side just above the entrance of the upper west affluent. Here the glacier from melting was turned into a series of slush-covered lakes which were best crossed on hands and knees. The broad west branch enters the Rose at over 17,000 feet. It is a snow expanse from one containing wall to the other. Crevasses, which are legion in the lower part, remain mostly snow-covered, and therefore doubly dangerous, until August. After the first quarter-mile the gradient is a steadily-ascending one, to where in its upper portion it assumes the appearance of a slowly rising plateau. From here its source, still distant, may be seen, backed by two beautiful snow cones, which we called the Silver Throne, probably about 23,000 feet high, and Lower Silver Throne. We climbed beyond the crevassed zone and camped near the centre of the glacier at 18,700 feet. This camp, where we passed three nights, was a source of many lamentations from the coolies, because of the absence of rocks and of lakelets so abundant on the Rose glacier.

The next day in a strong wind, temperature 14° Fahr., we continued on due west toward a depression between the Lower Silver Throne and the north border-peaks of the glacier. On near approach a reach of large open crevasses was found to stretch across the glacier, and to get around these we should have to traverse the glacier and climb up the mountain flanks to look over the dip now seen to exist beyond. As geographical information from a high point was our object, it was clear that that was not the place to find it. The guide insisted that, did we go, we should see only a precipice instead of a pass. I decided that the depression must, however, later be examined, as it might prove to be a real west source passage to another region. A high col connected the higher and lower Silver Throne peaks, so we climbed the slopes a little south leading over the lower peak flanks, and in two and a half hours reached the snow yoke.

Here an interesting scene lay before us. A large glacier, the visible source of which was walled in by high rock-cliffs, lay 4000 feet below. Long moraines extended nearly to its reservoir, evidencing that this lay at not much over 16,000 feet. It seemed probable that the Kondus glacier backed against the Siachen west tributaries, further east near the Sherpigang wall, and so we put aside the thought of its being the Kondus. It did not appear wide enough or far enough north to be the Baltoro. Awaiting further developments, photographs were taken of a peak facing the Silver Throne on the opposite side of the new glacier. This proved to be a

TARIM SHEHR PROMONTORY TAKEN FROM 18,400 FEET, SHOWING JUNCTION OF TARIM SHEHR BRANCH WITH THE UPPER ROSE GLACIER.

ON THE TURKESTAN LA OR NORTH-EAST SIACHEN WATER-PARTING, 19,610 FEET. GROUP OF PEAKS TO THE SOUTH FIRST SEEN FROM THIS POINT.

PEAK 8, PHOTOGRAPHED FROM JUNCTION PEAK AT 18,400 FEET.

. ON THE SIA LA, 18,000 FEET. BRIDE PEAK IN BACKGROUND.

lower peak of the Golden Throne, the highest being behind further north. We faced an unknown, unmapped area, being confronted by four or five first-order Himalayan giants, the tortuous ridges, intricate valleys, and lesser peaks of which were hurled into a stupendous mountain ensemble, not to be accounted for with precision at first glance. I shall return to these peaks, which are seen to greater advantage from the high Silver Throne plateau. This saddle, 19,600 feet, can be crossed by mountaineers, but is not feasible for a coolie caravan.

With weather still fine the next day, facing a still more glacial wind than on the previous one, we retraced our steps toward the source. This time, by ascending on the flank of the north containing glacier-ridge, a view over the gap was obtained. Here, as I had surmised, the real outlet to the west Rose source was seen. From the ridge connecting the lower Silver Throne with the opposite mountain *arête* a long snow defile ran downward to the new glacier, a bit of which could be detected in the distance. Being satisfied on that point, we turned south again, and, climbing beyond the col previously visited, over rising schrund-gashed hillocks, headed toward what appeared to be a still higher ridge south of the main Silver Throne peak. Finally surmounting a snow wall, we reached a large plateau not before supposed to exist, stretching south. A ridge at its end was climbed which overhung the glacier discovered the day before. The plateau at its lowest point is at 20,450 feet, and at its highest 21,000 feet altitude. From here the lower Silver Throne was overlooked, and a grand view of the Gusherbrums and the King George V. group obtained.

Peak 23, or Hidden peak, elusive and well named, no doubt, by Conway so far as its relation to the Baltoro glacier goes, assumes another aspect in connection with the Rose glacier. It is seen 30 miles down the glacier as its *motif majeur*. As I said before, its great east *arête* forms the north water-parting ridge, and its east and south flanks throw off the snows that produce the reservoir and upper *névé* of this glacier. Its high satellite-peaks again drain to and form much of the snow supply of the upper west Rose affluent, so that this group may truly be called the originator and large supplier of the Rose glacier. Peak 23 is also called by the Indian Survey Gusherbrum I., but it is a higher, more impressive peak than the others of that name, and stands at some distance removed from them. This mountain, with the three high peaks south-east of it on the same ridge, builds a group of its own 11 miles long distinct from the peaks to the north, and I have the honour, with the gracious permission of His Majesty, to call it on my map the King George V. group. Particularly impressive from the Silver Throne plateau were the two second highest mountains of the group which were first discovered and triangulated by this expedition. The highest of these, seen in the photograph taken at 21,000 feet, I have with the permission of Her Majesty named Queen Mary peak. Its height is 24,350 feet. The second peak,

23,270 feet, I have pleasure in naming Mount Hardinge, after H.E. the Viceroy of India.

It may be noted I have named no peaks already triangulated and numbered by the Indian Survey, and I entirely agree with the policy of the Survey in keeping Government maps of Asia free from personal names. *Re* Himalayan nomenclature, I quote the greatest authority. Col. Burrard says, "The numerous peaks which have no native names, have been numbered in a scientific way, after the astronomical system." As the present system of nomenclature has extended throughout Southern Asia, the new Survey symbols placed on my map seem likely to become permanent ones. This in no way affects the nomenclature adopted by explorers for new peaks shown on their private maps, and it seems to me appropriate that illustrious British names should adorn the first detailed and fairly accurate map made of Asia's greatest glacier.

Our high plateau was of particular geographical interest, as from it could conclusively be proved that the King George V. group with its formidable precipices prohibits both at the north and west Siachen sources all passage from the Siachen to the Baltoro glacier, which is not a complement of, nor has it any relation to, the Siachen. Behind the sheer snow-painted ridge seen in the foreground of the King George V. group in illustration a snow valley runs to a col climbed by Mr. Peterkin, who saw a distant snow ridge below the Golden Throne probably lying above the Baltoro glacier, in which direction he was looking, but near the col the snow expanse he overlooked ends in a rock precipice falling to the main Kondus source that we examined later and found to be an impassable wall. The mountain ridge alluded to in the view separates the valley and col visited by Mr. Peterkin from the pass crossed by us to the Kondus and runs nearly parallel to it in direction.

While on the Silver Throne plateau clouds rising from the south swirled over our heads, dropping occasional snow-flakes as a warning for us to depart. We had gleaned most of the secrets of the Siachen, and could not complain if the weather-god now turned his attention to fulfilling the prayers for storm contained in the Tawiz of the coolies. Contouring chasms and plunging to above the knees over the sodden snow-hillocks, we returned to camp, and, after a night of blustering wind and snow, descended to the Siachen in a blinding storm. I was, however, convinced that in order to complete the exploration of the Siachen basin and sources, a return must be made to the icy west head, and our exit carried out by the lately-found passage there. We next descended the Rose glacier to the great bend, a short distance above the point reached by Dr. Longstaff from Nubra. Here, owing to delinquencies on the part of a headman, we were forced to return to the high Rose.

Mr. Peterkin thoroughly carried out the mapwork on the lowest Siachen to the Nubra river. In spite of careful observation, nothing was seen of

Dr. Longstaff's cairn at the point indicated on his sketch-map. In some unknown way it has doubtless been demolished.

Above Tarim Shehr on the return, a camp was pitched at 16,600 feet on moraine-strewn ice, where supply and transport exigencies, abetted by continual fog and storm, kept us prisoners for ten days. The minimum temperatures at this camp were 10° and 15° Fahr. only, but with no sun by day and high winds at night we felt the cold more than at dry, cold, higher camps where the thermometer fell to near zero. Tinned provisions disappeared slowly, for even the guides had long since arrived at caring for little beyond soup and light food. They attributed this to *ennui* at the long detention, but I think it was the effect of altitude. We had been four weeks, with the exception of three days, always above 16,600 feet, and most of that time above 17,000 feet, and I noticed that all our Europeans ate steadily less as time elapsed. I have often observed this effect upon the appetites of our Europeans, after any stay above 16,000 feet. I still maintain, H.R.H. the Duke of the Abruzzi's experiences to the contrary, that Europeans do suffer from insomnia at camps above 20,000 feet, for I have seen these facts borne out, not only upon ourselves, but very decidedly upon our numerous hardy young guides and porters during seven different Himalayan expeditions.

On August 20, our caravan of sixty-six left Boulder camp and marched up to the end of the east latero-median moraine. Here the final preparations of coolie food for twelve days were made, although the weather was uncertain and the sky leaden. The next day, under a threatening sky, we crossed the Rose, the three crows gaily leading, and ascended toward the old snow camp. The snow was at its worst and the coolies lagged badly, notwithstanding half of them wore nailed boots. We camped not far from the col in a freezing temperature and snowstorm at 3 p.m. It cleared about six, and after a cold, still night, minimum temperature 3° Fahr., we continued on to the ridge, Nature for the first time in many days smiling radiantly upon us. A somewhat long descent occurring before the final climb to the col places the actual saddle measured by boiling-point at the same height as the camp, 18,700 feet. This Siachen-Kondus water-parting-col I have named the Sia-La. Here the caravan was photographed against a background of the lower Silver Throne *arêtes*, with Bride peak looming grandly into the deep blue vault above.

The descent to the Kondus glacier is of about 2600 feet. The gradient of the upper third was sharp. At about the halfway point the surface became greatly broken by huge chasms and fissured by wide crevasses running from side to side, which necessitated long *détours*. Fortunately, a good route on the right side was chosen, for by August 20 the left side is so riven it cannot be traversed at all. A moraine ridge below was reached by noon, where we lunched in full view of the large glacier streaked by black and grey moraines and of the precipitous grim walls at

its head. These walls were thoroughly examined, as we were now quite certain that we were on the upper Kaberi,* or Kondus glacier. The Sia La descends to the Kondus not at its head, but from the east, and its existence would not be suspected by persons ascending even the upper part of the glacier. Near the source, behind the Silver Throne *arêtes* and on the true left side, the glacier leading up to the pass is first seen. Hence the topography is as follows: Bride peak, seen apparently nearly over the Kondus from the pass, really lies some miles west—so far west that it is actually beyond and west of the second Kondus north-west branch seen on the map, and of which I shall soon speak.

A lower peak of the Golden Throne rises above the Kondus source north, and the King George V. group lies behind the Kondus head also north. Peak 23 itself lies some 8 miles north of the Kondus reservoir, and its snows on this side do not drain to that source. Those of a part of Queen Mary peak do fall to the shelf above the Kondus precipices. The deductions made by the Abruzzi expedition, that a probable pass exists from the Kondus head to the Oprang basin and Urdok valley, are quite awry, but the opinion of Signor Novarese that the westernmost extremity of the Siachen communicates with the Kondus exact, so far as it goes. But he is wrong in his supposition that the Kondus head intervenes between the Siachen and the Urdok glacier. The Kondus head lies further west and south than he supposes, and between that head and the north Siachen water-parting, which overlooks the Gusherbrum glacier, the broad 11-mile-long King George V. group intervenes.

Overtopping the Kondus reservoir is a high granite and shale wall broken at one point by a projecting *arête*, between which and the main glacier a short glacier descends to the reservoir. The *arête* of the lower Golden Throne builds a part of the Kondus wall, and above, far behind, lies what on Conway's map is called "Probable Saddle." Here may be a col overlooking the Baltoro, but there is no pass from it to the Kondus glacier.

South-west of the Golden Throne massif, at point on Conway's map marked "Kondus Saddle," is in reality a sheer snow wall, which does away with that saddle altogether. Thus these two saddles as passes are non-existent. The Kondus basin is entirely closed so far as any communication with the Baltoro glacier is concerned, and has but one outlet, which is to the Rose glacier west affluent. The mountain topography here is complicated, and can only be unravelled by overlooking the Kondus source and its outlying great mountains from elevated points and by visiting the source itself. We were fortunate to do this in clear weather, and I think my report of the connection, geographical position, and

* To natives of the Kondus valley the Kondus glacier is known only by the name Kaberi.

conditions here will be found in the main to be correct by future explorers.

Following the Kondus down southward, numerous affluents are seen entering from the right side, descending from the precipitous narrow ridge which divides the main north-east from the second north-west branch. At about 10 miles down, the chief stream, with which we are dealing, makes a distinct bend south-west, and below the bend the north-west affluent enters, the two streams uniting and forming one, which continues south to its tongue in the Kaberi nala. Any one ascending the Kondus from the tongue, in 10 miles would see nothing of the main north-east branch, and even where the bend occurs, nothing is seen of it until an opening is discovered between gigantic border-cliffs. It is the most hidden of hidden glaciers. No Survey man nor any one else having gone more than a mile above the tongue before our 1911 expedition, accounts for the mistake on the Survey map, which shows one main glacier running to the base of Peak 23.

To return to the north-west affluent. This is shorter than the north-east, and is separated from it by a narrow barrier-ridge, which in its upper part we overlooked from the Silver Throne col. We saw also from there a part of the sharp wall rising above the north-west Kondus head. We ascended this branch far enough to see that Bride peak lay west of its source, and that the reservoir was like the main north-east Kondus, walled in by high cliffs, which afford no pass to the so-called Chogolisa saddle existing on Conway's and the Abruzzi maps. In 'Karakoram and Western Himalaya,' Dr. de Filippi says that "The southern wall of Chogolisa is very steep, and that the Kondus was not visible from the Duke's point of observation." This I can believe, and it serves only to confirm my own observations. Had H.R.H. the Duke of the Abruzzi been aware that there are two upper Kondus glaciers, when he stood on "Chogolisa," he would have realized that the "large valley running between two parallel chains of high mountains on the other side of the Kondus basin" was not the Siachen, but probably the north-east Kondus glacier. He was above the north-west Kondus basin, and doubtless could not see the reservoir of the north-east Kondus. Further, there is no pass from the north-west Kondus to the Chogolisa glacier next west of the Kondus, for we found on examination in 1911 an impenetrable mountain chain on that side of the Chogolisa glacier head. Dr. Calciati states that he thinks one of his older coolies said that he in his youth had crossed from the Kondus to Hushe. It is not likely that such a passage was ever made by natives from anywhere on the Kondus, but at any rate no passage exists at the north-west Kondus head to the Hushe glaciers.

As obviously no pass exists from the Kondus to the Baltoro or the Chogolisa glaciers, the name Chogolisa saddle in the sense of pass should not be inserted on future maps. As a euphonious native name there is

no objection to it, but, as the glacier bearing the same name does exist and claims no relation to the so-called saddle, it is, to say the least, an irrelevant and misleading term.

As stated in my preliminary report the Kondus is the most tiresome glacier we have met with in the Karakoram to travel upon. After three miles from its source, it descends in hillock-moraines in places 200 to 300 feet high. These extend from one containing wall to the other, and I recall only two small stretches of a quarter-mile, where it was safe to proceed in a narrow sand-ravine existing between these hillocks and the cliffs of the perpendicular rock-peaks which border the glacier. At a point 6 miles from the tongue, on the left orographical border cliffs we painted the letters F.B.W. with date, in black, and built a cairn on a ridge under the rock face.

As to climatology, I have a few facts to add. In 1911, between August 20 and September 15, and in 1912, during July and August, we found, as a whole, better weather-conditions on the Rose glacier than we have ever noted in the Western Karakoram. The south-west wind brought mist or storms, and there were plenty of them, but the north and north-east winds brought fine weather which lasted for longer periods than we have experienced on the Biafo, Chogo Lugma, or Hispar glaciers. Dr. Longstaff thinks June the best month for high climbing in the Eastern Karakoram, but in 1912, July was a better month for high work than June. In both these years the south-west monsoon was light in India, and the whole vale of Kashmir suffered much from drought. In the Kapalu district almost no rain fell in July and August of either years. These facts doubtless counted much in our favour on the glaciers. Certainly 1911 and 1912 were favourable weather years for snow work in the Eastern Karakoram, but they offer no basis for claiming better or worse climatic conditions in general for the Eastern over the Western Karakoram.

No Tawiz amulet was worn to bring us luck, and fair skies were needed to carry out the work planned. Certainly what measure of accomplishment in that line was ours came through persistent endeavour and the aid of the weather-god, who on special and critical occasions favoured us, and to him are due my deep salaams.

APPENDIX.

Notes of the Rose Glacier having been an Old Time Route to Nubra or Chinese Turkestan.

Regarding the eight stone shelters, one stone circle, and two cairns, found by my expedition at Ali Bransa, Tarim Shehr and the North Spur camp, and their bearings on the question of the Bilaphond and Rose glacier having been once used by natives as routes to Turkestan and Nubra, I have a few words to say.

In the *Geographical Journal* of June, 1910, Col. Godwin-Austen says that "after looking at the map," it appears to him that this pass, referring to the "Saltoro," "was in all probability a way by which the people of Baltistan got into Yarkand." This remark was made after Dr. Longstaff's short visit to the Rose glacier, when nothing was really known as to the water-partings on that glacier, and when all that could be said was mere supposition.

From what I have seen of them, I do not hesitate to negative the idea of either the Bilaphond La or the Rose glacier having been at one time a route from Baltistan to Chinese Turkestan.

The two remaining points of exit are those by the east Tarim Shehr affluent and by the Lower Siachen to the Nubra valley.

The passage, should it exist, from the head of the Tarim Shehr glacier, could only lead to the Remo or an adjacent glacier draining to the Shyok valley, and that would be, apart from the prohibitive ice-conditions, a circuitous route. No shelter-huts were found on any part of the promontory at entrance of the Tarim Shehr glacier into the Rose, only one stone circle, and on the 17 miles of glacier to the source no vestiges were seen. It has been said, I know, that, when driven by stress of circumstances, natives will find a way out over most arduous routes, yet even allowing for this, it is most unlikely that people either from Nubra or from Baltistan would attempt passing by the east Siachen affluent.

The suggestion by Dr. Longstaff that the Bilaphond La was once "used as a short cut from Baltistan to Nubra," appears fairly plausible, although no records of this passage having been employed are available. No signs of former human birds of passage were found by my expedition between Tarim Shehr and the Siachen tongue, but the fact remains that Ali Bransa was by previous generations occupied as a bivouac and most likely more than once.

What tells most against the idea of this having been a usual route to Nubra, are the very difficult physical conditions of the Rose glacier the whole 23 miles to its tongue, the unfordability from May to September 15 of the Nubra river, and the sparsely inhabited and supplyless area encountered in the Nubra valley before Pananik village is reached.

Whether like serious obstacles were less in evidence in former times, must be answered by one competent to solve these problems, which I confess I am not. So far as the present-day Baltis are concerned, I feel sure they would proceed by the Chorbat, or any other remote road, rather than thread the mazes of the Rose glacier and face the Nubra water-crossings.

A route to Nubra by the Rgyong La, since on its summit Dr. Longstaff found a cairn, would, it seems to me, have been chosen by natives, rather than the one over the Bilaphond La, but that does not bear upon the point here at issue, which hinges on the presence of the shelters at Ali Bransa. Again, perhaps the Baltis previously said to inhabit the Ghyari valley, on occasion climbed to the Rose glacier, carrying their investigations as far as the opposite Tarim Shehr grass-area and then returned over the pass home.

This suggestion credits the old-time Baltis with exploring proclivities which certainly those of to-day are not guilty of possessing.

These questions in human geography, if I may so call them, are interesting, pertaining as they do to the Rose glacier, a vast intricate snow expanse, stretching its long snowy affluents, ice-bound water-parting ridges, and formidable crevasse-riven tongue, as defiant bulwarks toward Baltistan, Chinese Turkestan, and Nubra. But, like those queries arising daily in other sciences, they must, I fear, abide their time and await a solution that may or may not be forthcoming.

Note on the Construction of the Map of the Siachen Glacier, by C. Grant Peterkin.

The map is an extension from, and is based on the fixed points of, the G.T.S. of India. During the survey five of these fixed points were observed to, namely, $\frac{\text{Pk. 8}}{52\text{ E}}$ $\frac{\text{Pk. 36}}{52\text{ A}}$, $\frac{\text{Pk 35}}{52\text{ A}}$, $\frac{\text{Pk. 33}}{52\text{ A}}$, and $\frac{\text{Pk. 23}}{52\text{ A}}$. The area covered by this survey, about 600 square miles, is given on the G.T.S. atlas sheets 44A S.W. and S.E. The topography there shown had been altered by the explorations of Dr. T. G. Longstaff's expedition (*Geographical Journal*, vol. 35, p. 622). An outline map, on the scale of 4 miles to 1 inch, was issued at Dehra Dun, showing alterations made by that expedition, and this was embodied in the R.G.S. map published as above. These were the existing maps at the time of this expedition.

The Survey of India now publish degree sheets, which are to supersede the old atlas sheets. The nomenclature of fixed points according to these sheets is shown.

The survey party was working on the glacier about nine weeks, having crossed the Bilaphond La on June 24, and recrossed on August 27. The season was an excellent one, at least 80 per cent. of the days being suitable for observation to high peaks. As is already known, the peculiarity of this glacier is its inaccessibility from the region of the tongue, except for a few weeks in the late season. This makes little or no difference for survey work, as in the central area good views are generally to be obtained of the fixed points which are available for interpolation, while the upper Nubra valley is narrow and much enclosed by high mountain walls, which would make the extension of triangles from any base measured there very inconvenient.

Surveyor Surjan Singh, of No. 1 party, Survey of India, made a very good plane-table sketch on the scale of 2 miles to 1 inch. All plane-table accessories were lent by the Survey of India. I also had one of Reeves's telescopic alidades with parallel bar attachment, a useful instrument in such country. I took with me a tacheometer of the form usually known as the Indian Survey subtense instrument; but with large distances and the difficulty of access to points it did not prove useful, and I relied on the plane-table for whatever detail was required.

My initial plans were dependent on the possibility of measuring a suitable base. On getting on to the surface of the glacier, I decided that no base of sufficient length, even for extension, could be measured without spending a great deal of time, and even then its accuracy would be doubtful owing to the peculiar unevenness of such a surface and its liability to quick change. I therefore crossed the glacier at once to the Terim Shehr promontory, being a central position from where to make a rough reconnaissance.

The triangulation was carried out with a 5-inch transit theodolite fitted with verniers reading to 30″, which was lent by the Survey of India. In countries where transport is a consideration, surveyors will probably find one of the light and compact 4-inch instruments, now so well made, to be as useful as the larger ones.

The first station was made on a low spur of Junction peak, from which position there was an excellent view of several high peaks to the west, two of which were the survey points, $\frac{\text{Pk. 8}}{52\text{ E}}$ and the twin peak, $\frac{\text{Pk. 35 and 36}}{52\text{ A}}$

A base was deduced from the two known sides, $\frac{\text{Pk. 8}}{52\text{ E}}$ $\frac{\text{Pk. 36}}{52\text{ A}}$, and $\frac{\text{Pk. 8}}{52\text{ E}'}$ $\frac{\text{Pk. 35}}{52\text{ A}}$. Colonel Renny Tailyour's solution from two fixed points was used ('Auxiliary Tables' (4th edit.), p. 85). The two values obtained for the side AB were 7400·8 and 7405·1 feet. After leaving Tarim Shehr the survey was carried northward up the main stream of the glacier. From stations P and Q observations were again taken to the fixed points $\frac{\text{Pk. 8}}{52\text{ E}}$ and $\frac{\text{Pk. 36}}{52\text{ A}}$. The value obtained for the side PQ, when working from the base AB, was 12,098 feet, while the direct reduction from the fixed points gave a value of 12,118 feet.

In the brief season on these high glaciers no preliminary reconnaissance survey can be done by a small party such as we were, if it is proposed to cover any considerable area. The constant moving of camp and keeping up the necessary supply of ata kept our few coolies always busy. The building up of firm platforms for observing was a constant difficulty, which, in the case of stations on the moraine, was added to by the rapid melting which takes place in the middle of the day. At the head of the glacier there was no possibility of building stations, and the theodolite had to be set up on the snow-field. It was hoped that the triangulation could be carried to some station in the Nubra valley; however, owing to time and the untoward failure of the commissariat arrangements for the coolies, most of the southern part had to be abandoned. Owing to bad weather at the end of the season, triangulation was not carried up the Lolophond glacier to the pass.

The heights obtained from theodolite vertical angles are dependent on those of the G.T.S. fixed points from which they were initially deduced. From stations A and B the heights were carried up the glacier, being checked at stations where fixed points were observed to, and from station I. the height of Hidden peak was deduced. This gave a value of 26,491 feet. The G.T.S. value is 26,470 feet. The coefficient of refraction used was 0·055; this was tested by the observation of reciprocal angles. Hypsometrical readings were also taken. Arrangements were made by Mrs. Bullock Workman for lower station readings to be taken at Skardu three times daily while the expedition was in the field. Three hypsometrical readings were taken on different dates at the Bilaphond La, giving heights of 18,328, 18,365, and 18,428 feet. The mean value was taken. Hypsometrical readings at D station gave a height of 16,666 feet. The trigonometrical height, which at this station was deduced from direct rays to G.T.S. points, was 16,395 feet.

The Survey of India report, that hypsometrical heights taken by them have been found to be as much as 600 feet in excess at trig. stations (*Geographical Journal*, vol. 41, p. 155).

The survey party carried two aneroids graduated to 25,000 feet, which had been made for Mrs. Bullock Workman by Hicks. One was fitted with Watkin's patent; both gave steady readings up to 16,000 feet, but above that the Watkin became erratic. The patent action was not used at all. Photographs were taken at several theodolite stations, and were used in plotting detail.

A sketch of the Kondus glacier basin is shown on this map. The details of its construction are given in the note with the map. There has been a little difficulty in getting a satisfactory junction, especially in the lower part.

The PRESIDENT (before the paper): I am glad to see so large an audience assembled to give a welcome to our old friends, Mrs. Bullock Workman and her husband, Dr. Hunter Workman.* I say they are old friends of ours, because not merely are we familiar with their work from the written accounts of it, but they have both lectured to us on several occasions; exactly four years ago they paid us the compliment, for the first time, of lecturing together, as they are about to do to-night. It is quite fifteen years since Dr. and Mrs. Workman commenced their work in the region of the Himalayas. Since then they have carried out expedition after expedition with marked success and with scientific results of high value. It is a little more than three years since Mrs. Workman gave her last lecture before the Society on the subject of the Hispar glacier. Since then, she and her husband have been busy in a difficult and complicated region of the Eastern Karakoram, and it is with the results of these last expeditions that they are going to favour us to-night.

Sir FRANCIS YOUNGHUSBAND (after the paper): I think even those of you who have never been in those parts must have realized, from the magnificent photographs which Mrs. Bullock Workman and Dr. Hunter Workman have brought back, the terrible obstacles which they have had to overcome in order to accomplish what they did, and certainly those of us who have been there and know what the difficulties really are, can say that it is only by the greatest perseverance, pluck, and determination that such obstacles could have been overcome. I think that probably the part which I should most advantageously speak to you is in regard to this mysterious Soltoro pass, which Mrs. Workman has referred to. She was in doubt why it was called the Soltoro pass, but I think we simply called it the Soltoro pass because we did not know any other name to give it, just as mathematicians use the expression "x" to denote an unknown quantity. All that was known to us was a rumour that a pass did exist from Chinese Turkestan in the north into the Soltoro district of Baltistan on the south. There had been such reports for many years, and in 1889, when I was deputed by the Government of India to explore the passes into Hunza, I was asked on the way to try and find this mysterious Soltoro pass. I had crossed the watershed in 1887 by the Mustagh pass, and I imagined the Soltoro must be somewhere about the limit where Dr. and Mrs. Workman reached in 1912 expedition. I explored up that Urdok glacier, which is marked on the extreme north-western corner of the map, and at the top of the glacier I saw what I thought must be a pass, and ascended it about halfway when I was deterred from going any further by two avalanches very similar to that depicted in the slide which Dr. Workman has shown. I was just able to see that, at any rate, there was no practical route from Turkestan down to Baltistan by that way. But the curious thing is that this summer, quite unexpectedly, we heard of an officer from India who had come across the range by some way which he himself cannot define accurately on the map, from Turkestan down to Baltistan. He had gone up into Kashgar territory on the north by the Karakoram pass on the extreme east of these maps, and when in Turkestan, his hunter had told him that there was a more direct way down to India, by a pass to the west of the Karakoram pass, and ten years ago he came down by this same way west of the Karakoram pass, and certainly east of the Mustagh pass, and came out at Skardu in Baltistan. How he did it —whether he came over this glacier, which Mrs. Workman has so vividly described this evening, or by some other way, it is difficult to say. He assumed at the time that the route was known, and as he had no surveying instruments with

* Dr. Hunter Workman's paper will be published later.

him, for he was simply on a shooting expedition, he was unable to say exactly how he came. I hope this point will be finally cleared up by the expedition which Dr. de Filippi has organized, which is now at work in that region. Dr. Longstaff, in 1899, was, I think, the first to establish the interesting point that this Siachen glacier was really one of the great glaciers of Asia. Its mouth, as Mrs. Workman has said, was first seen by Henry Strachey many years ago, but it was then supposed to be quite an ordinary glacier—that is, ordinary for those regions, and it was reserved for Dr. Longstaff, when he crossed the Bilaphon-la, which he then thought must be the Saltoro pass, to first establish the magnitude of this glacier which Dr. and Mrs. Workman have now explored to its extremities, and mapped scientifically and accurately, so that we now have a full and detailed description of this remarkable glacier. Another point I was interested in in Mrs. Workman's account, was what she said about having seen a little brown butterfly. Some years ago I met a gentleman travelling in that region, who asked me whether, when I was crossing high passes, I had seen any butterflies? I said, "No, certainly not; high passes are not the places where you see butterflies." He said there was, some years ago, a brown butterfly caught by the Forsyth Mission of 1873 on the Karakoram pass, and he had been offered £400 to secure another specimen of the same butterfly. I hope Mrs. Bullock Workman will get £400 for her specimen. I desire to congratulate Mrs. and Dr. Hunter Workman on the very fine work they have accomplished, and on the highly valuable scientific results they have attained, and which could not have been accomplished without great care of organization before they started, without extreme persistence and pluck while on the journey, and without further elaborate working out when they came back.

Dr. T. G. Longstaff: I have listened with great interest to the paper this evening. In 1909 I spent four months in this region, though only seven days and five nights were passed on the Siachen glacier. I was accompanied by Lieut. Morris Slingsby, 56th Rifles, F.F., for the first half of the trip, and Dr. Arthur Neve, of Srinagar, joined us for the Saltoro pass; his assistance was of very great value. For the last two months I had the good fortune to travel with Captain D. G. Oliver, at that time British Joint Commissioner for Ladak. My paper appeared in our *Journal* for June, 1910. I have had a series of maps, including my own sketch-map, put up in the next room. Neve wrote an account of the first part of our trip for the *Times of India*, September 2, 1909, which is of particular interest, because it was written before the identity of the upper Siachen glacier had been discovered: a *résumé* of this article appeared in our *Journal* for November, 1909. His 'Thirty Years in Kashmir,' just published, contains a great deal of valuable and most reliable information on this and the neighbouring districts. His great influence with the natives give him advantages altogether denied to the ordinary traveller.

It is satisfactory to find that the Siachen and Teram glacie s each obtain a mile more length than I credited them with, though I note with regret that the former loses one-twelfth in extreme breadth. It is also satisfactory to find that our location of Younghusband's saddle was substantially correct. We are even agreed as to the mistake I made in attributing so great a height to Teram Kangri, a mistake I endeavoured to rectify by communicating Colonel Burrard's letter to our *Journal* (vol. **39**, p. 71) two years ago, and by publishing in the *Alpine Journal* (vol. **26**, p. 307) an account of the remarkable mountaineering achievements of Mr. V. W. B. Collins of the Survey of India, who successfully triangulated the peak in 1911 (compare also *Geogr. Journ.*, vol. **37**, pp. 28–29). In the use of those points actually visited by us in 1909 and determined barometrically

I see that on the new map there is invariably an increase of altitude shown, averaging 270 feet in the nine comparable instances.

We have to thank the lecturers for giving us, by their enterprise, Mr. Grant Peterkin's really first-rate survey of the Siachen glacier. I showed him all my photographs and data before he started, and since he returned I have seen his and have watched his map growing at our quarters. I am certain that there will be no corrections of any importance for subsequent travellers to make in it. Of course, when we get beyond the limits of his own survey on to some of the outlying snow basins and on to the Kondus, the map becomes once more a sketch-map, just as mine was. That he did not see my cairn above the great bend is only to be expected, since he passed nearly 1000 feet below it and at a distance of at least a mile away from it.

I feel that the Italian expedition has hardly been treated fairly. It is true that they believed that Younghusband's saddle would be found further west than is shown on my map and where the lecturers have now placed it. But I really must point out that apart from this—only advanced as a supposition—there is no essential difference in the geographical relations between the Baltoro and the upper Siachen, as described by the Italians and by the lecturers. The great height (21,000 feet) of their camp on Chogolisa saddle gave the Italians a most commanding view. The quotation cited by the lecturer from page 315 of de Filippi's book makes it appear that they did not see the Kondus basin. Yet they say (de Filippi, 'Karakoram,' etc., pp. 441–2) that the Kondus glacier "was seen to intervene between the Baltoro and the recently discovered upper Siachen." "The westernmost extremity of the Siachen valley will not communicate directly with the Urdok, but only with the Kondus": this has been proved by the discovery and passage of the Sia La by the lecturers. Again, "Hidden peak is not the most easterly peak of the Gusherbrum group, for eastwards of Hidden peak rises another"—evidently that named after Her Majesty by the lecturers. This is all just as the lecturers have demonstrated this evening. Undoubtedly, Dr. and Mrs. Workman are the first Europeans actually to traverse the Kondus glacier, and they have very materially increased our knowledge of it. They have also visited the Sher-pi-gang for the first time, and of course they are the first to explore the highest reaches of the Siachen glacier itself.

With regard to the suggestion that because there are no practicable passes there, the names Kondus saddle and Chogolisa saddle of Conway's and the Italian maps should be abolished for the future—this is based on a misunderstanding of the rules of mountain nomenclature by the lecturer. They are called saddles *because* they are not passes. Compare the Agassiz *Joch* and the Hugi *Sattel* on the Finsteraarhorn. The Italians themselves indicate that they are not passes, but that is no reason for the abolition of two names of historical interest.

I fear that the constant changing of geographical names will lead in the future to as much confusion as has fallen upon biologists from the same cause. The name Saltoro pass has already been accepted by the Survey of India. It was recognized by Shere Ali Khan of Khapalu when we were getting information from him in 1909. It is used in the official 'Sketch of the Geography and Geology of the Himalaya Mountains and Tibet' (Chart 20). It also appears on the official map to illustrate Younghusband's explorations.

But apart from any of these precedents it is unquestionably the most important high pass leading directly into the Saltoro valley—from anywhere. The study of these native names is fascinating, but beset with difficulties. Lolophond sounds rather familiar to me. It is the name of a camping-place,

apparently our second camp beyond the Saltoro pass. To such the natives not infrequently attach the name of some person who has been there. For instance, Doulatbeguldi—"the place where Doulat Beg died." Now, *Loloff* was about the nearest the Baltis could get to my name, though Ladakis and Tibetans can get much nearer to Longstaff. It is quite an unexpected compliment for which I am duly grateful. The suggested change of the name Teram (properly Term, pronounced Térram) to Tarim (pronounced Tarreem) is unfortunate. We obtained this name Term from our coolies: it was the only name connected with the upper Siachen glacier which we could extract from them. Tarim must be either Persian or Turki. It is as if we altered an English place-name into a somewhat similar-sounding French one: as, for example, Cambridge into Cambrai. And again, surely Siachen should stand unchallenged as the name of the greatest glacier in Asia. Both these names also have been accepted by the Indian Survey. The lecturer seems to infer that the Baltis supplied the name Siachen. Possibly its identity may have penetrated to the Saltoro valley in consequence of our discoveries. But I must remind you that when we stood on the Saltoro pass in 1909 and saw this great glacier before us, no one knew what glacier it was nor whither it flowed; according to all previous notions we already stood on the Turkestan water-parting. Its origin was obviously in the neighbourhood of Hidden peak (*Geogr. Journ.*, vol. **35**, p. 630) and the main interest was to find out where it went to, a riddle only solved with Captain Oliver's help three months later, when it was found that we had added some 500 square miles to the Indus basin. I understand the lecturer to say further that the name Siachen is not known to the people of the Nubra. Yet it is a Ladaki name, and was obtained directly from the upper Nubra villages. Neve also obtained this form of the name some years earlier: the Nubra people further told him that three marches up the glacier was a pass to the Remo ('Thirty Years in Kashmir,' p. 293). Therefore I ventured in this one instance to change the old Survey spelling Saichar to Siachen, giving the derivation practically adopted by the lecturer. The "ch" is pronounced soft as in *chenmo*. All the names on my map, published by our Society, had been decided upon in consultation with the Indian Survey at Dehra Dun, and were actually printed by them on the outline sketch-map, which they so kindly drew from my material. I welcome the new name "The Hawk" (22,200 feet on the Workman's map) as a most appropriate one for this beautiful mountain, and should like to withdraw our temporary name "Cornice peak" (22,140 feet on my map) as not good enough. None of these temporary names were printed on my map, but were used in my text.

Now as to the historical evidence for the former existence of a direct route over the Turkestan water-parting to Yarkand, used in combination with the Saltoro pass. In my paper I hastily assumed the negative view, attributing the stone shelters which we found at Ali Bransa (*Geogr. Journ.*, vol. **35**, p. 629) to a route to Nubra only. Further reading had convinced me that the historical evidence is distinctly in favour of the positive view, and now the stone circle on the Teram peninsula and the cairns at Spur camp, discovered by the lecturers, definitely prove to my mind that such a route was formerly in use. The study of glaciers is of very recent growth. Changes may occur far more rapidly than has usually been expected. Remember that the Mustagh pass was in use so late as the time of Ahmed Shah—some eighty years ago. When Younghusband forced it, it had been completely abandoned.

The lecturers themselves have indicated a practicable route from the Oprang valley, though we cannot make absolutely certain that they saw the Urdok glacier till that region is definitely surveyed. Hayward (*J.R.G.S.*, vol. **40**,

p. 59) refers very circumstantially to an old route from Khufelung, leading both directly to Nubra and to Chorbat: in the latter case, the Saltoro pass would also have to be crossed. (Cf. Sir Henry Trotter, *J.R.G.S.*, vol. **48**, p. 177, and Sir T. E. Gordan 'The Roof of the World,' p. 15). That it is necessary to cross *two* passes by this route between Turkestan and Baltistan was indicated by what Shere Ali Khan told us in 1909 (*Geogr. Journ.*, vol. **35**, p. 624). Again, Vigne (vol. **2**, p. 387), when weather-bound on the Bilafond glacier, wrote that "two lofty and difficult ridges were to be crossed on the way." On his map, which I am showing this evening, is printed "Way over glacier by Ali Bransa to Yarkand." I find also a curious association between the names Khapalu, at the mouth of the Saltoro valley, and Khufelung, a camping-place near the head of the Yarkand river, on what I believe to be the old route. Strachey's map marks the latter actually as "Khapalu Agze," while Shaw prints it "Kapaloong." Moorcroft even writes Khapalu as "Kafulun"; of course, in this part of the world, *f* and *p* are often confused. Until de Filippi is able to explore both the Remu and the Khufelung valleys, it is impossible to get at the truth of these traditions, for no part of the main water-parting between the Karakoram pass and the point reached by the Workmans has yet been explored. But I have a strong suspicion that the officers alluded to by Sir Frank Younghusband really crossed the pass we have all been looking for, and preceded our party on the upper Siachen.

There is another interesting problem in this region for de Filippi to solve. As I have often said, none of us ever thought that Teram Kangri was particularly high until Slingsby and I reached the Rgyong La, nearly 19,000 feet. From there we saw and photographed a very imposing group of mountains which I thought was Teram Kangri (*Geogr. Journ.*, vol. **35**, plate 1, opp. p. 640; *Alpine Journ.*, vol. **25**, plate 1, opp. p. 485, and vol. **26**, p. 313). But a comparison of the altitudes of the different peaks of the Teram Kangri group obtained by Mr. Collins for the Survey of India and of the more complete data obtained by Mr. Grant Peterkin for the Workmans' map, with the outline of the peaks shown in my photograph, appears to me to disprove my assumption. In this case, these peaks must constitute another unknown and very lofty mountain group somewhere to the north-east of Teram Kangri, probably in the Remu area, as indeed I might have inferred from a letter I received (March 28, 1910) from Colonel Godwin Austen. Extreme difficulties of access have so far kept the geographical secrets of this north-eastern region of the Karakoram hidden from our view, but if any one can unveil them it is de Filippi and his very talented companions who are even now wintering in Baltistan.

With regard to Dr. Workman's paper; as to the hypothesis which I suggested with regard to the physiographical relations between the Gusherbrum range and the Teram Kangri group, though such a high authority as Professor Novarese has already enunciated (de Filippi's 'Karakoram,' p. 443) the views now brought forward by Dr. Workman, yet no less an authority than Dr. Oldham appears to favour (*ibid.*, p. 447) my own theory. The gaps between Teram Kangri and the Gusherbrums and between the Gusherbrums and K_2 do not necessarily affect the structural unity of the range, and Dr. Oldham considers that they are probably "part of the same general area of special, recent, uplift." My view that the Siachen may turn out to be a homologue of the Baltoro gains very strong support from a photograph shown me by Mr. Grant Peterkin taken from the northern branch of the western Siachen source, not visited I understand by Dr. Workman. In this photograph I recognized, to my astonishment, the Mustagh tower far down the Baltoro, showing that despite the intervening Kondus basin (which I

indicated on my map) the main valleys of the Baltoro and Siachen do form a continuous line of depression. I think that any one reading Novarese and Oldham's Appendix to de Filippi's 'Karakoram' must agree that the Italians are justified in their geological deductions. Furthermore, I see no reason to change mine with regard to the Siachen. Certainly it is impossible for any one to be positive about the succession of the rocks until they have been thoroughly examined *in situ*, and this still remains to be done.

Sir MARTIN CONWAY: It is just over twenty-one years since I returned from the region which is on the extreme edge of this map, and it is, therefore, with some diffidence that I venture to speak on the question at all, because one's memory of detail naturally grows feeble in that time. One thing, however, I may say, which touches in no manner on geographical detail, and that is, that if there did exist any ill-tempered critic desirous to make the worst that he could of the work in the mountains of the Karakorams of Dr. and Mrs. Workman, he would, after saying his worst, have to make certain omissions. He would be compelled to allow that, during the best part of fifteen years, they had devoted a great portion of their time to the serious study of this enormous mountain region. He would be obliged to say that they had undertaken expedition after expedition of the most arduous kind; that they had carried those expeditions through with ever-increasing ability, increasing elaboration, and with the increasing success which comes from accumulated experience. He would be obliged to say that the map of this part which was in an unsatisfactory state, over a considerable portion of it, has, since their visits, been filled out with detail which is obviously truthful; that they have added, therefore, enormously to our knowledge of the greatest knot or group of mountains on the face of the Earth; and that as a matter of fact they have "hitched their chariot," as it were if not to a star, at all events to a great mountain group, and as long as those mountains continue to attract the attention and the admiration of people who take an interest in such matters, their name must be indissolubly associated with them. Dr. Workman has referred to a set of glacial phenomena, which he has classified and in which he has taken a great interest. I have before broken a lance with him as to the use that he makes in relation to them of the term "nieves penitentes," because I think he stretches that term to cover certain phenomena which it ought not to be used to cover. The term "nieves penitentes" is a South American name for a particular thing, and I doubt if South Americans would recognize that object in some of the phenomena to which Dr. Workman applies the term. That, however, is not a matter of great importance. He referred to a particular set of forms of glacier-ice on the Baltoro glacier, which he had not seen, but which have been seen now by three or four parties—I mean the blades of white ice that jut up out of the surface of the glacier to considerable heights—30 or 40 feet, and that follow one another down the glacier in a long succession. I looked in his photographs for any examples of the same formation, and though there were some that distantly resembled them, there were none of identical form or nature.

I have no doubt that the explanation he gives of them is correct. These blades of ice are denuded pressure ridges; where the ice has been most compressed there it melts the least readily, and consequently these blades of ice stick up above the rest of the surface of the glacier. What, however, I principally noticed as the general outcome of looking at the photographs they showed us, was that in the Siachen district we come into a mountain area altogether different in kind from that which surrounds the basins of the Baltoro and Hispar glaciers, which I myself traversed. In that other region the mountains are, for the most

part, unclimbable mountains. They are, for instance, such needles as that first view Dr. Workman showed; peaks overwhelming in altitude, precipitancy, and every quality that is least favourable for a climber. On the other hand, this group of mountains we have been taken to to-night is one that suggests possibilities of ascent, and, if I was not far beyond ever thinking of going off the level ground now, I should feel tempted to have a try at them myself. I feel no doubt that in the future we, as a Society, shall have the opportunity of making the acquaintance of some of these great peaks in detail, when the story of their further exploration is related before us, and then we shall be able to congratulate whoever it may be that returns in triumph from some great ascent, as warmly as I congratulate Dr. and Mrs. Workman on the renewed success they have attained in one more great expedition.

The PRESIDENT: I should like on your behalf, and as President of the Society, to associate myself with the words that have fallen from the speakers this evening —all of them experts of the highest authority—as to the interest and value of the two papers to which we have listened. I shall not presume to add anything to what has fallen from their lips, but I am expressing your feelings as well as my own when I say that we have never here listened to two papers of higher scientific interest, illustrated by more beautiful slides.

IS THE EARTH DRYING UP?*

By Prof. J. W. GREGORY, D.Sc., F.R.S.

1. The Reported Desiccation of the World and its Effects. 2. Three Forms of the Desiccation Theory. 3. Changes of Climate in Recent Geological Times. 4. Palestine—a Test Case; Evidence for Desiccation; Ancient Population; Woods and Rainfall; Ancient Climate and Water Supply; Evidence of Date Palm and Vine; The Pluvial Period in Palestine. 5. Egypt. 6. Greece. 7. Cyrenaica. 8. Northern and Western Europe. 9. Hungary; Roumania. 10. Central and Western Asia. 11. Africa, exclusive of the Mediterranean Coastlands. 12. North America. 13. Greenland. 14. Local Character of Climatic Changes. 15. The Pluvial Period of the Mediterranean a Result of the Glacial Period. 16. The Test of Synchronism. 17. Local Variation of Post-Glacial Climate. 18. Summary of Conclusions. References.

1. The Reported Desiccation of the World and its Effects.

Underlying the irregular and apparently capricious variations of the weather, a regular cycle of change has been recognized by the study of long continued observations. This cycle appears to be only a secondary movement on a still greater cycle, and it, according to some geographers, is in turn controlled by variations the length of which can only be measured in geologic ages, while glacial deserts were being changed into torrid wastes. In recent years we have been often warned that one of these great climatic changes is now carrying the world, slowly and irresistibly, toward world-wide drought. The view that the Earth is becoming steadily

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* Royal Geographical Society, December 8, 1913. Map, p. 232.

and even alarmingly drier was advocated in a paper read to this Society by Prince Kropotkin in 1904, and a considerable body of evidence appears to support this view.

Thus in recent geological times, glaciers were far larger and more numerous than they are now. Then followed a time characterized by such vast lakes that Prince Kropotkin has proposed to call it "the Lake Period." Hence, according to him, the world has recently experienced three successive climates, those of the cold Glacial Period, the moist Lake Period, and the existing period of world-wide desiccation. That the Earth is now becoming drier is consistent with many impressive facts. The post-glacial lakes have grown smaller; they have been replaced by marshes, or even by meadows. The great inland sea of south-western Asia has shrunk until it is now represented only by the Caspian and the Sea of Aral. Asiatic travellers bear unanimous testimony that in large areas of Central Asia, lakes and swamps are still disappearing, fertile plains are still being converted into deserts, rivers are ceasing to run, and the deserted ruins of once busy cities are being buried in sand. All these changes are interpreted to mean that the rainfall over central Asia has decreased and is still decreasing.

Similar evidence is reported from many widely separated parts of the world. The desolation of Palestine is attributed to a decrease in its water supply. In tropical Africa, many lakes have vanished, and Lake Chad has become so much shallower and smaller that it has been described as "a disappearing lake." Livingstone's first contribution to South African geography, which was unluckily lost, described the increasing desiccation of the country beside the Kalahari desert. In North America, great freshwater lakes have dwindled to salt pools; Indian cities, once numerous in certain districts, have been deserted, and these districts are said to be incapable of now maintaining a population corresponding to the number of ruined settlements. In South America, Dr. Moreno (**1901**,* pp. 581, 586) and Sir Martin Conway (**1904**) have referred to evidence of cultivation in land now abandoned owing to the failure of the water supply; and Bowman (**1909**) has described recent desiccation in southern Bolivia. The maps of the interior of Australia mark many extensive lakes which are to-day mere clay pans or salt swamps, while the once fertile plains around them have withered into desert.

Many of the geographical changes have been proved by unmistakable evidence, and according to Prince Kropotkin they occasioned some of the greatest historic movements among men. Thus he attributes the overthrow of the Roman Empire to the dwindling rainfall of Central Asia, which turned whole tribes of agriculturists into nomads by the repeated failure of their crops, and finally drove the drought-stricken barbarians

* The dates printed in black type are those in the list of references at the end.

into Europe, owing to their own lands having become uninhabitable. Similarly, Prof. J. L. Myres (**1910**, pp. 679–80) has attributed the various invasions of Egypt to droughts in Arabia and Libya. If this desiccation of the Earth is still in progress it must lead to further great political changes; for in time the populations of the world will be forced out of the centres of the continents and crowded into the continental margins.

This theory affects so many geographical questions that I gladly accepted the invitation to reconsider the evidence on which it rests, and discuss the conclusions which can be founded on the facts.

2. Three Forms of the Desiccation Theory.

The theory that the climate of the world is becoming drier has been advanced in three main forms. As promulgated by Prince Kropotkin, the climate is undergoing a steady progress towards drought, though there may be fluctuations in the advance.

Prof. Ellsworth Huntington formerly adopted the theory in this form; but in recent years he has modified it, and now regards the most conspicuous change as pulsatory, causing an alternation of wet and dry periods; and he considers the differences between them to have been sufficient to have very important political and economic results, the dry periods having been sufficiently arid to render vast areas uninhabitable and to effect the moral ruin or extinction of whole nations. Although he recognizes repeated returns towards moister conditions, he agrees with Prince Kropotkin that the resultant tendency of the present climatic movement is towards greater aridity. "At certain periods the climate appears to have become rapidly drier. At others it became moister, but, on the whole, the general tendency has been from moist to dry, and possibly from cool to warm. Thus it appears that the climate of the present time is distinctly drier than that of two thousand years ago. Nevertheless, at certain times during the two thousand years conditions appear to have been even drier than at present" (Huntington, **1910**, p. 665).

A third form of the theory represents the climate as varying in great cycles, each of which may take thousands of years to run its course. Thus Mr. Rowland Thirlmere (**1905**, pp. 595–599) holds that our spring and summer "grow shorter and colder year by year. The apricot tree, now slowly, but surely, disappearing from Central Europe, is a proof of some great climatic change inexorably approaching. Up to 1250 A.D., our temperatures were getting higher every year, but since that season of maximum heat the European springs and summers have been getting gradually colder. Chillier still they must become until the period of maximum cold is reached, probably about the year 2300 A.D." (Thirlmere, **1905**, pp. 594–5). He quotes figures which he claims to prove that the world is moving forward to one of the great turning-points of seasonal change. "We

Europeans," he says, "are almost imperceptibly hastening towards a minimum of spring and summer brightness. Before four hundred years have passed, there will be no wine made in Champagne, and the grape-vine will not exist in that part of France, nor in Burgundy, nor in the Gironde. The vintages of Medoc and Macon will have become historical. Provence will be the only district producing wines north of the Pyrenees. Andalucia and the Mediterranean coasts of Spain will still make the red and yellow liquors for which they are now renowned. But the vineyard countries *par excellence* will then be Algeria, Morocco, and possibly Australia. Within ten thousand years Madrid, if she still exists, will have the winter temperature of Paris, Paris that of Berlin, and Berlin that of Stockholm" (Thirlmere, **1905**, pp. 598–599).

3. Changes of Climate in Recent Geological Times.

Evidence of a decreasing water supply has been brought forward by so many eminent authorities, from such widely scattered localities, that it appears at first overwhelming. Moreover, it is not improbable, for there is abundant evidence that various regions have undergone fundamental climatic change in times which are geologically recent. Thus formerly most of the British Isles was covered by sheets of snow and ice, and the only inhabitants were Arctic animals and plants. About the same time the glaciers in most parts of the world were far larger, Scandinavia and parts of North America were buried by ice sheets like that of Greenland, and glaciers existed in regions that are now ice-free. The plants found in successive layers in peat bogs show that there have been marked variations of climate in the British Isles and Scandinavia since the disappearance of the ice-sheets. Thus, in Sweden, the hazel once grew farther north than it does now, so that during one part of post-glacial time the Swedish climate was milder than it is at present.

If such climatic changes have happened during recent geological time, the occurrence of considerable changes in rainfall during the historic period is quite possible; and there is nothing inherently improbable in the view that the influences which rescued northern Europe and northern America from their former Arctic desolation are still at work, and are causing the climate of the world to become still warmer and drier.

It is important, however, to distinguish between the climatic changes in historic and in prehistoric times. The glaciers of the Great Ice Age disappeared from the British Isles many tens of thousands of years ago. The changes in climate indicated by the successive floras of the peat-bogs were also prehistoric; and the disappearance of the great lakes left by the melting of the ice and snow of glacial times was probably completed many millenniums before the Christian era. For example, there seems no evidence of any appreciable change in the topography of the Midland Valley of Scotland since the Romans, in about 140 A.D., built their

wall from the Clyde to the Forth; but between that date and the end of the Ice Age the changes had been so extensive that they probably occupied very many times as long as the 1770 years that have elapsed since the building of the Roman wall.

As Prince Kropotkin attaches so much importance to the dwindling of lakes, it is necessary to remember that they may vary in number and size owing to many factors which are independent of climate. For earth movements may enlarge or destroy them; the uplift of an area may increase the rate of denudation and thereby deepen the valleys and drain the lakes; decrease of cultivation in consequence of tribal war may lead to the filling in of shallow lake-basins by wind-blown material; increase of cultivation and irrigation may lessen the amount of rain that flows into the lakes; or the removal of herds of animals that trampled down the ground and kept it impermeable, may also lessen the run-off of water into the lakes.

Similarly the advance of sand-dunes, which in some of the wetter parts of the coast of southern Australia are burying old forests and soils, and which have covered formerly cultivated land in eastern Scotland, may cause a succession of deposits which a future geologist might easily mistake for evidence of a dry period having replaced a moist period.

4. Palestine—A Test Case.

A more precise test is needed than the variation of lakes and the ruin of cultivated land by wind-blown deposits. Probably the best available test is supplied by vegetation, and especially by any changes that may have taken place in the range of food plants or fruit trees in the countries of which we have the longest written records. Palestine furnishes a very good test case of such a nature.

Evidence for Desiccation.—The striking contrast between the present and past conditions of Palestine appears at first to indicate some fundamental change in geographical conditions. Palestine is described in the Bible as a land flowing with milk and honey; it was fertile in vine and olive; many incidents suggest that it was well wooded; and, according to the Old Testament statistics, it had a dense population. Now it is a barren, arid land, with a scanty vegetation, swept by parching winds from the Eastern deserts, and occupied by some 700,000 people, who are mostly Arabs and mostly paupers; and towns with only a tithe of their ancient population are said to be at the very limit of the available water supply.

Ancient Population.—This deplorable change, according to one explanation, is due to maladministration and the blighting presence of the Turk; and it is held that under better government the country could be restored to its ancient fertility and prosperity. But, according to an alternative view, Palestine has been paralyzed by a climatic change; and this second

explanation is affirmed on many grounds. It is claimed that the ruins of the ancient cities indicate that they had a population far larger than could be supported by the present water supply. Thus the population of Gerasa, the ancient Jerash, in the land of Gilead, has been described by Prof. Ellsworth Huntington (**1911, p. 279**) as insignificant in comparison with that of the ancient city; and yet he holds that the water supply available only just suffices for the present inhabitants (**1911, pp. 278–282**). The same author quotes the opinion of Prof. H. C. Butler of Princeton, that the ancient ruins indicate that some districts of Syria had a far larger population than they could now support. According to the Book of Numbers (i. 3 and 46), the Israelites in the wilderness included 603,550 men capable of bearing arms; the census in the reign of David records the number of available warriors as 1,300,000 (2 Sam. xxiv. 9),* and the total population then has been estimated as from five to six millions; and if Josephus be correct in his statement that 1,100,000 of the inhabitants of Jerusalem perished during the siege by Titus, the population of the city must have been as prodigious as overcrowded. It would certainly be difficult to maintain in modern Palestine the population indicated by these records.

Woods and Rainfall.—Changed climatic conditions are also inferred from the forests. Palestine is represented as having been, in Old Testament times, a well-wooded country. Joshua (xvii. 15 and 18) promised the Ephraimites that "the mountain shall be thine; for it is a wood, and thou shalt cut it down"; and the "wood of Ephraim" is often referred to in Bible history; and the fact that timber was used in ancient buildings in districts where none grows now is quoted as evidence of the former greater abundance of forests.

Ancient Climate and Water Supply.—Another argument is afforded by the difference in the caravan routes into Palestine. Thus, according to Prof. Huntington (**1911, p. 269**), three thousand years ago a great trade was conducted over the road from Egypt to Palestine, and it is now commercially useless owing to lack of water.

More direct evidence is offered by the former higher level and greater size of the Dead sea. Many ancient terraces mark the former positions of its shore. One of the most noticeable of the old beaches stands about 250 feet above the present surface of the water; this beach, however, was formed some five to six thousand years ago, so that it is prehistoric; but from the position of the boundary between the tribes of Benjamin and Judah, Prof. Huntington claims (**1911, pp. 311–313**) that in the time of Joshua the Dead sea level stood higher than it does now. The level is said to have been higher also in the time of Christ, though it was

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* The number in 1 Chron. xxi. 5, for the same census, is given as 1,570,000; Josephus adopts the smaller total, though differing in the numbers assigned to the two kingdoms.

admittedly as at present in 333 A.D. Hence, there does not appear to have been any serious progressive fall in the surface of the lake since the time of Joshua, though there have been periods of rise and fall due to temporary variations in the rainfall.

Prof. Huntington concludes (**1911**, p. 375), "All these facts, and others not here mentioned, make a strong case in favour of the theory that from about 1100 B.C. or a little later, down to the time of Christ, comparatively moist conditions prevailed most of the time."

From such considerations many authorities have adopted the view that there has been a material change in the climate of Palestine since Old Testament times. This conclusion is advocated by Prof. E. Hull, Prof. O. Fraas, Dr. T. H. Fischer in his well-known memoir on the climate of the Mediterranean lands, Fr. R. P. Zumoffen, Prof. Huntington, and by others. Observers in adjacent lands have supported this view, such as Mr. D. Carruthers in Arabia and Prof. J. L. Myres in Egypt.

Former Population exaggerated.—Nevertheless the evidence seems unconvincing. The estimates of the former population are probably greatly exaggerated. Hilderscheid has rejected the estimates in the time of Moses and David (Hilderscheid, **1902**, p. 98); and so does Dr. Stevenson, Professor of Hebrew in Glasgow University, in the following answer to an inquiry as to the probable ancient population of Palestine:—

"The literature of the Old Testament itself does not seem to contain any numerical estimate of the population of Palestine in Old Testament times. Such numbers as those in Judges iv. 10; xx. 2; or 2 Sam. xxiv. 9, have no claim to be regarded as the result of calculation or estimate of any kind. The numbers of those carried into exile by the Babylonians (as given in 2 Kings xxiv. 14 and Jeremiah lii. 28–30) may be, or may have been originally, correctly recorded, but their relation to the whole population of Judah is a matter of complete uncertainty. A round number of considerable historical value may be obtained from the statement in 2 Kings xv. 19 f. A poll-tax of fifty shekels produces one thousand talents (reckoning three thousand shekels equal to one talent) when levied on sixty thousand men. The Hebrew historian, accordingly, assumes that there were sixty thousand *gibbore hayil* in the northern kingdom at this period (eighth century B.C.). Unfortunately the exact status of the *gibbore hayil* is unknown. They may be spoken of as citizens or burgesses, but it is more than doubtful if they were equivalent to the free population capable of bearing arms.

"Of the data contained in the inscriptions of the Assyrian kings, the most important, meantime, is one of Sennacherib, according to which the population of the kingdom of Judah, exclusive of the inhabitants of Jerusalem, is apparently given as 200,150 people of all ages (end of the eighth century B.C.). Such a figure is not, however, to be implicitly relied on without confirmation. The same king states that there were forty-six walled cities in Judah, and possibly a calculation may be based on this

statement when the average areas of these towns has been sufficiently determined by the excavations now in progress. After the final conquest of the northern kingdom (721 B.C.), King Sargon declares that he carried off 27,290 captives. But previous to this the kingdom had been reduced to small dimensions, and the proportion left behind can only be guessed at."

Josephus' statement about the population at the time of the great siege is obviously ridiculous.* If 1,100,000 people perished during the siege, the population cannot have been less than 1,200,000; whereas William Smith's 'Dictionary of the Bible' estimates that the population then "cannot have exceeded 60,000 or 70,000"; and as, according to the same authority, the Roman army "consisted of four legions and some auxiliaries—at the outside 30,000 men" (W. Smith, **1860**, *op. cit.*, pp. 1011–12), it could hardly have besieged a city of a million desperate people. From the area of Jerusalem and the estimate that in Eastern cities the population is never more than 1 to 50 square yards, Smith calculated that the population of Jerusalem could hardly have reached 50,000, and probably (Smith, **1860**, p. 1025), even in the days of its greatest prosperity, included only 30,000 to 45,000 souls.

Scarcity of Forest.—The arguments based upon the former woods and forests of Palestine is of little value, for the term translated "wood and forest" may have meant only scrub. Principal George Adam Smith tells us "the Hebrew word we translate *forest* ought to be *woodland*, and perhaps only *copse* or *jungle*, and we may safely conclude that the land was never very much more wooded than it is to-day. The distribution of woodland may have been different, but the woods were what we find the characteristic Palestine wood still to be—open and scattered, the trees distinguished rather for thickness than height, and little undergrowth when compared with either a northern or a tropical forest. Here and there groves of larger trees, or solitary giants of their kind, may have stood conspicuous on the bare landscape" (G. A. Smith, **1897**, pp. 80–81. See also Hilderscheid, **1902**, p. 100). The general statements in the Old Testament are fully consistent with the conclusion of Principal G. A. Smith and Dr. Hilderscheid; for though we hear much of the cedars of Lebanon and the oaks of Bashon (Isa. ii. 13), very little useful timber appeared to grow in Palestine itself. The wood for the temple was imported from Lebanon. No doubt in many places there is less vegetation than formerly; for woods are said to have disappeared since the time of the Crusades; but this is not likely to be a climatic effect since, in some places, the woods have actually increased; for Principal G. A. Smith tells us (**1897**, p. 80), "On the other hand, copse and wood cover many old clearings, as on Carmel."

Unchanged Rainfall.—An extensive deforestation of Palestine has often been adduced as the cause of a reduction of the rainfall; but any appreciable change in the rainfall is quite unproved. Palestine now has a moderate

* His figures are scornfully rejected by Beloch, **1886**, p. 246.

rainfall. The average for Jerusalem for a mean of forty-seven years (1860–1906) is 26 inches; so that Palestine has a heavier rainfall than Essex, and there is no adequate evidence that it has been larger at any time since the days of the Patriarchs. Thus Hilderscheid concludes (**1902**, p. 103) that, "referring to the conditions of rainfall in Palestine in ancient times, as presented to us by the Bible and the Talmud, and comparing the same with the present conditions of rainfall in the Holy Land, no important reduction of the rain in subsequent time is established."

Principal George Adam Smith is equally emphatic. "Did the rain in ancient times differ from this? The Old Testament data are, of course, not specific, but at least sufficient to justify a negative answer. Some authorities on the climate and fertility of Palestine have, indeed, argued that, as in the Mediterranean basin as a whole, so throughout Palestine in particular, the climate has suffered a change for the worse through the diminution of the rainfall. One of the reasons given for this conclusion is the alleged decrease of the woodlands of the country. I have elsewhere shown that in all probability these were never much greater on western Palestine than they are to-day. The other natural features by which the rainfall is influenced—the position of the city relatively to the sea, and the prevalent winds—have remained the same; while the references to climate and weather in the Bible and the Mishnah are fully consistent with the present conditions. We may conclude, therefore, that the rainfall upon Jerusalem in ancient times must have been very nearly the same as it has been observed to be during the last forty-six years. Even if it was a little greater, the difference cannot have been of much practical moment" (G. A. Smith, **1907**, p. 78).

The unaltered nature of the rainfall is also maintained by Watt from a study of records at Hebron (**1903**, pp. 134, 147 †).

Moreover the distribution of the rainfall during the year appears to have remained the same. Practically all the rain now falls in the winter months, and only 2½ per cent. falls in the six months from May to October; and that rain was very exceptional in the summer is indicated from the comparison in Proverbs (xxvi. 1), "as snow in summer and rain in harvest," and the statement in the Song of Solomon (ii. 11), "Winter is past, the rain is over and gone."

It has been claimed that a statement in the Mishnah, the earliest of the Talmudic books, indicates that about 200 A.D. the rains began a month earlier than they do now; for a three days' fast was ordered, if no rain had fallen by a date, the limits of which are between October 22 and November 21. According to the authorities cited by Keeling (**1909**, p. 87), the date would fall, on an average, on November 7, and the rains now often begin by the middle of October. Huntington (**1911**, p. 421), in his summary of the dates for the beginning of the rains in Jerusalem, shows that during fifty-nine years for which records are available, the important rains began twenty-four times in October, twenty-seven times

in November, seven times in December, and once in January.* Hence the fact that the Jewish farmer became seriously anxious if no rain had fallen by November 7, suggests that there has been no change either in the habits of the rain or of the farmers.

A translation of the passage in the Mishnah has been published by Keeling (**1909**, p. 87), and he does not regard it as any evidence of a climatic change. Prof. G. Hellmann of Berlin has also referred to the evidence of the Mishnah and concludes (**1908**, p. 226), from the evidence of that authority, "that the amount of rainfall then considered as normal for a good crop corresponds pretty closely with that deduced from the modern observations made by Mr. Thomas Chaplin at Jerusalem, whence it can be inferred that the climate of Palestine has not changed."

Conder (**1876**, pp. 122, 123), who had called attention to the statement in the Mishnah, concludes in spite of it that "the seasons are unchanged," and Prof. Huntington (**1911**, p. 422) dismisses it as so indefinite that no argument can be based on it either for or against any change in the date of the rains. The utmost that could be inferred is that, about 200 A.D., the rains may have begun a little earlier than they do now.

Unchanged Climate.—The evidence of the Bible shows that even in the days of the Patriarchs Palestine had a very similar climate to that of the present time. Throughout Bible history, the country was periodically stricken by drought, and the frequent scarcity of water is indicated by many Bible incidents, such as Abraham's gift to Hagar of a bottle of water and her trouble after its exhaustion. Abraham's quarrel with Abimelech was over a well (Gen. xxi. 25). Famines drove Abraham to Egypt (Gen. xii. 10), and Isaac coastwards into Philistia (Gen. xxvi. 1), and led to the emigration of Jacob and his family into Egypt and of Ruth's father-in-law into Moab (Ruth i. 1). Later on, in the time of the kings, famines were also frequent. During the reign of Ahab there was no rain for three years (1 Kings xviii. 1); and the brook beside which Elijah was fed by the ravens dried up because there had been no rain in the land (1 Kings xvii. 7). Great care was clearly taken of the water supply, and that the houses had large tanks, as they still have in Jerusalem, is shown from the incident of Jeremiah in the waterless but miry cistern of Malchiah (Jer. xxxviii. 6); and that every house in town or country had its cistern is implied in the exhortation of Rabshakeh, "Eat ye every one of his vine, and every one of his fig-tree, and drink ye every one the waters of his own cistern" (Isa.

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* According to Zumoffen (**1899**, p. 356), the meteorological records at Jerusalem for thirty-six years, from 1861 to 1896, show that October has a mean of 1·2 rainy days and November 6·1; hence the beginning of the rains in October was a normal occurrence. Robinson (**1841**, vol. ii. p. 97) says that the autumnal rains "usually commence in the latter half of October or beginning of November."

† Mr. Watt says, "It is unquestionably true that the weather lore of the Biblical writings is in every way applicable to the average weather conditions of to-day" (Watt, **1903**, p. 147).

xxxvi. 16). In Palestine, then, for water during the summer, people were anciently as dependent upon the winter store as they are to this day.

Further, so far as we can judge of the climate from the Bible statements, it appears to have been essentially similar to that of the present time. Many of the prophets give graphic descriptions of the drought-stricken character of the country. "The beasts of the field," says Joel (i. 20), "cry also unto thee; for the rivers of water are dried up, and the fire hath devoured the pastures of the wilderness"; and Jeremiah's warning (Jer. iv. 11–12), "At that time shall it be said to this people and to Jerusalem, A dry wind of the high places and of the desert toward the daughter of my people, not to fan, nor to cleanse, even a full wind from those places shall come unto me," suggests that the dry desert winds gave Jeremiah as just cause for lamentation as they give to modern visitors.

The balance of expert opinion seems strongly in favour of the climate of Palestine having undergone no important modification during historic times. Thus Ankel concludes (**1877**, p. 123), "The question whether the climate of the lands west of the Jordan has been essentially changed since historic memory, we must answer with a negative"; and he attributes the changes in its condition to political causes and believes with human help "it could again become as formerly, a land full of milk and honey, could again be of higher consequence to the civilized world, and present the same bloom as in the days of David and Solomon" (Ankel, **1877**, p. 129).

Lieut. Conder, with the intimate acquaintance of Palestine gained during his prolonged survey, after a careful discussion of "the Fertility of Ancient Palestine," denies that there has been a change in the climate, the seasons, the vegetation, or water supply. He decides (**1876**, p. 132)—

"The seasons in Palestine are unchanged, and there is no evidence of any very remarkable falling off in the amount of rain, though the data are not sufficient for a definite conclusion on the subject.

"The spontaneous growth resembles in character that mentioned in the Bible. In some districts it has greatly decreased, in others it has spread; woods of timber trees have decreased in extent, but still exist in part of the districts formerly occupied by them.

"The present water-supply answers exactly to that described in the Bible, in the Talmud, and in Josephus, and depends entirely on geological formation.

"To sum up, the change in Palestine is one of *degree only and not of kind*. The curse of the country is bad government and oppression. Justice and security of person and property once established, Palestine would become once more a land of corn, vines, and olives, rivalling in fertility and wealth its ancient condition, as deduced from careful study of such notices as remain to us in the Bible and in the later Jewish writings."

As a more recent authority may be quoted, Prof. I. Benzinger, Professor of Old Testament Exegesis in the University of Berlin. In the

article on Palestine in the Jewish Encyclopædia (vol. ix., 1905, p. 497) he emphatically rejects the view that there has been any change of climate in Palestine during the historic period. "All the references of the Old Testament which bear on this question apply," he says, "exactly to modern climatic conditions, and even if there were then more forests than at present, as is frequently asserted, this could not have been the case to an extent great enough materially to influence the climate."

Again, Prof. A. H. Sayce, in his work on 'Patriarchal Palestine,' states (1895, pp. 19, 30), that in the time of the patriarchs the country was not well wooded, forest trees were scarce south of the Lebanon, the palm grew only on the sea-coast and in the valley of the Jordan, the tamarisk and sycamore were hardly more than shrubs, and the amount of ground fit for cultivation was no larger than it is now; and he tells us that in Samaria and Judah "The want of water was the only difficulty; in most cases the people were dependent on rainwater, which they preserved in cisterns cut out of the rock."

No doubt there have been fluctuations of good seasons and of bad all through the history of Palestine. Famines occurred in the time of the Patriarchs and drove them into Egypt just as they drive the present inhabitants into beggary; but the changes from year to year and from decade to decade appear to be now of the same extent as those of ancient times. Certainly the modern rainfall records give no indication of a failure of rain as complete as in the time of Ahab.

Evidence of Date Palm and Vine.—Nevertheless some more certain test is necessary than the general conclusions which can be based upon the historical and geographical evidence of the Bible. In the absence of rain gauge and thermometric records, the most precise test of climate is given by the vegetation; and fortunately the date palm affords a very delicate test of the past climate of Palestine and the eastern Mediterranean. This argument was first used by the Danish botanist and meteorologist, J. F. Schouw, in 1826; it has been extended by various authors, such as the astronomer Arago (1833), Principal J. D. Forbes of St. Andrews in 1862, and D. Eginitis, Director of the Athens Observatory, in 1898. The date palm has three limits of growth which are determined by temperature; thus it does not reach full maturity or produce ripe fruit of good quality below the mean annual temperature of 69° F. The isothermal of 69° crosses southern Algeria near Biskra; it touches the northern coast of Cyrenaica near Derna and passes Egypt near the mouth of the Nile, and then bends northward along the coastlands of Palestine (Map 1).*

To the north of this line the date palm grows and produces fruit, which only ripens occasionally, and its quality deteriorates as the temperature falls below 69°. Between the isotherms of 68° and 64°, limits which include

* The observed mean annual temperature of Jerusalem is 60° F. (Exner, 1910, p. 120); reduced to sea-level it would be 67° F.

northern Algeria, most of Sicily, Malta, the southern parts of Greece and northern Syria, the dates produced are so unripe that they are not edible. In the next cooler zone, north of the isotherm of 62°, which enters Europe in south-western Portugal, passes through Sardinia, enters Italy near Naples, crosses northern Greece and Asia Minor to the east of Smyrna, the date palm is grown only for its foliage, since it does not fruit.

Hence at Benghazi, on the north African coast, the date palm is fertile, but produces fruit of poor quality; in Sicily and at Algiers the fruit ripens occasionally; and at Rome and Nice the palm is only grown as an ornamental tree.

The date palm therefore affords a test of variations in mean annual temperature of three grades between 62° and 69°.

This test shows that the mean annual temperature of Palestine has not altered since Old Testament times. The palm tree now grows dates on the coast of Palestine, and in the deep depression around the Dead sea; but it does not produce fruit on the highlands of Judæa. Its distribution in ancient times, as far as we can judge from the Bible, was exactly the same. It grew at "Jericho, the city of palm trees" (Deut. xxxiv. 3 and 2 Chron. xxviii. 15), and at Engeddi on the western shore of the Dead sea (2 Chron. xx. 2, Eccles. xxiv. 14); and though the palm does not still live at Jericho—the last apparently died in 1838 *—their disappearance must be due to neglect, for the only climatic change that would explain it would be an increase in cold or moisture. In olden times the date palm certainly grew on the highlands of Palestine; but apparently it never produced fruit there, for the Bible references to the palm are to its beauty and erect growth: "the righteous shall flourish like the palm" (Ps. xcii. 12); "they are upright as the palm tree" (Jer. x. 5); "thy stature is like to a palm tree" (Cant. vii. 7). It is used as a symbol of victory (Rev. vii. 9), but never praised as a source of food.†

Dates are not once referred to in the text of the Bible, but according to the marginal notes the word translated "honey" in 2 Chron. xxxi. 5 may mean dates. Prof. Stevenson tells me that "the word is rightly translated 'honey' and is the ordinary word for honey. I do not know how the alternative 'dates' comes to be given in the margin—it cannot rest on any authority. The Hebrew word very possibly denoted not only honey, but a kind of fruit syrup; but that has, of course, no bearing on your question." The Revised Version omits the marginal "dates."

It appears therefore that the date palm had essentially the same distribution in Palestine in Old Testament times as it has now; and hence

* Stanley, **1856**, p. 301, also pp. 143–145.

† Zumoffen (**1899**, pp. 483–8) holds that the palms must have fruited in Palestine, as some Hebrew coins represent them covered with fruit; but the evidence of the coins would appear to be inadequate in face of the negative evidence of the Bible, and Zumoffen's excellent statement of the arguments in favour of a climatic change in Palestine does not appear convincing.

we may infer that the mean temperature was then the same as now. If the climate had been moister and cooler, the date could not have flourished at Jericho. If it had been warmer the palms would have grown freely at higher levels and Jericho would not have held its distinction as *the* city of palm trees.

The vine too confirms the view that the climate of the highlands of Palestine has not changed; for the vine does not grow south of the mean isotherm of 72°, unless it be artificially shaded and protected. Vines and olives were the two most characteristic products of the highlands of Palestine. They were widespread: "Eat ye every man of his own vine" (2 Kings xviii. 31). Its fruitfulness was proverbial. "A fruitful vine" is the Psalmist's simile (Ps. cxxviii. 3); "the vine shall give her fruit," promised the prophet (Zech. viii. 12); and the twelve spies sent by Moses returned with bunches of grapes as evidence of the fertility of the promised land. In truth, so common was the vine that it passed into a proverbial expression: "and Judah and Israel dwelt safely every man under his vine from Dan to Beersheba in the days of Solomon" (1 Kings iv. 25).

The evidence of the vine supplements that of the date; for then as now Palestine was on the extreme southern edge of vine cultivation. The vine can be grown in Egypt as at Cairo, but it does not flourish there, and requires to be kept cool, shaded and moist. Its success at Engedi (Song of Sol. i. 14) was probably due to the same care.

In accordance with the evidence of the vegetation, Arago (**1833**, p. 204) expressed his conviction that "the mean temperature of Palestine does not appear to have changed since the time of Moses." Jas. D. Forbes concluded, "Hence the climate of Palestine, being neither sensibly hotter nor colder than it anciently was, is, of course, unchanged; and the direct evidence of modern travellers on the distribution of the vine and palm in that country leads to the same result" (**1862**, p. 179). Schouw ends his discussion of the botanical evidence with the verdict "that the climate in Greece and Italy, like that of Palestine and Egypt, has undergone no important change since ancient times. But if, on account of the later harvest and the possible growth of the beech trees in the Roman plains,* we might be led to the opinion that formerly the climate had been a little colder than now, the difference will hardly come up to one or two degrees, and will not be greater than might be occasioned by the cultivation of the north of Europe" (Schouw, **1828**, p. 324).

The failure of the palm to fruit and the luxuriant growth of the vine on the highlands of Judæa both indicate that the climate there in ancient times was neither hotter nor colder than it is now. In ancient and modern times Palestine was on the southern margin of the cultivation of the vine

* Arago (**1833**, p. 221) has also considered the evidence that the beech formerly grew on the plains near Rome, where the climate is now too warm for it; but he considers that this evidence must be disregarded, as it is inconsistent with so much else.

and was just skirted by the northern margin of the date. Hence there can have been no change in the climate of any practical importance, since the days of the Patriarchs and of the Jewish kings.

The Pluvial Period in Palestine.—There is, however, no doubt that, in times geologically recent, the climate of Palestine was moister than it is now; but this period was long prehistoric. The date of this change in the climate of Palestine has been recently considered by so eminent an authority on the later geological history of the eastern Mediterranean as Dr. Max Blanckenhorn. He brings to this subject the authority of his prolonged researches on the geology of Syria, Palestine and Egypt. According to him the last period in the geology of Palestine began with a great upheaval of the land in Lower Pliocene time. The Upper Pliocene was followed by great fracturing of the Palestine region and the formation of the rift-valley of Wadi Araba and the Jordan. These movements began during a time of heavy rains over the eastern Levant. Hence Dr. Blanckenhorn calls it the Great Pluvial Period. According to him it was contemporaneous with the first or Gunz glacial period of the Alps. Towards the middle of this Great Pluvial period, the earth-movements and accompanying volcanic eruptions in Palestine reached their greatest activity. Then followed a short dry period, which is correlated with the interglacial period of central Europe. After this dry interval, the Pluvial conditions reached their maximum intensity in Palestine, synchronous with the second or Mendel Ice Period in the Alps. Small glaciers then occupied the site of the cedar groves of Lebanon, and the Lake of Galilee (or Tiberias) was an inland sea which probably had an outlet through the valley of Araba into the Gulf of Akaba and thus to the Red sea. A long dry period succeeded in Palestine, contemporary with the middle interglacial period of the Alps; and then followed, in the Diluvial of Dr. Blanckenhorn, a lesser Pluvial period. This was contemporary with the third or Riss glacial period of the Alps. This lesser Pluvial Period was followed by the first entrance of man into Palestine; his primitive stone implements have been found in many localities on the plateaus and in the valleys around Jerusalem, beside the Lake of Galilee, along the coast of Phœnicia, and upon the plateau between Palestine and the Euphrates. It is this period, correlated with that of the Chellean and Acheulean men in Europe, which marked the beginning in Palestine of the steppe and semi-desert climate of the present day. That climate developed during the Upper Diluvial Period, which, according to Dr. Blanckenhorn, began 50,000 B.C. and lasted to 10,000 years B.C. It was contemporary with the last or Wurm Glacial Period in the Alps and with Palæolithic man of the higher stages, from the Mousterian to the Solutrian. At the close of this period, ten thousand years B.C., the climate in Palestine was the same as at the present time.

According therefore to Dr. Blanckenhorn, the moist period in Palestine ended fifty thousand years ago, and the existing climatic conditions had been completely established some ten thousand years B.C.

5. Egypt.

From Palestine it is natural to turn to Egypt, where also there was a Pluvial Period. Here, again, it was a period long prehistoric. The Bible statements and the evidence of archæology and geology appear to give no evidence of change of climate in Egypt during historic times. It has often been pointed out that the very earliest classical references to Egypt show that it had the same vegetation that it has now. Geological opinion in Egypt seems practically unanimous that the climate has been uniform for many thousands of years.* Geology and archæology point in the same direction. To Dr. W. F. Hume, Director of the Geological Survey of Egypt, I am indebted for the following statement: "As regards change during the historical period on a large scale I can find no serious evidence. An important factor is the continuous deposition of Nile alluvium for a period of probably not less than fourteen thousand years. During this time the finely balanced rainfall conditions connecting Abyssinia with the Nile valley must have existed without any appreciable change.

"The enormous length of the longitudinal sand-dunes in the Libyan desert also point to climatic stability, and temporary heavy rainfall of very short duration might easily have enabled nomadic peoples to discover the oases by some of the shorter desert routes."

Dr. Hume has previously published his opinion (**1910**, p. 421) that "none of the observations recorded in the past give any indication that the climate differed greatly from that of to-day, and rainstorms were as rare during the time of Herodotus as they are now." †

Archæological opinion may be represented by Prof. Flinders Petrie who, in a chapter on prehistoric Egypt, tells us that a dry climate had set in over Egypt before the land had quite risen to its present level (**1894**, p. 6), and he describes the Nile as running in early times in the Delta "between desert hills of sand," and the sandy rises on the delta as having been larger and more numerous than they are to-day. According to him the arid climate was established in prehistoric times. This view was also held by Schouw. "It thus appears that the temperature of Egypt, like that of Palestine, has not undergone changes since the time of the ancients, a result which might have been expected from the two countries being so near to each other. The moisture also does not seem to be different. The ancients speak much about the scarcity of rain in Egypt" (Schouw, **1828**, p. 319).

The opinion of Egyptian meteorologists has been expressed by Mr. B. F. E. Keeling (**1909**). According to him, the prevalent opinion in

* A list of authorities who hold this view is given by Berg, **1907**, p. 570.

† As another geological opinion may be quoted that of Dr. J. Ball, of the Egyptian Geological Survey, "This change of climate is equally evidenced by geological observation in other parts of Egypt. It is even likely that the climate of Egypt may be slowly changing at present; but the change within the historical period has been so small as to be practically negligible" (1912, p. 355).

Egypt is that the climate is becoming damper; but he shows that this view is not confirmed by meteorological statistics. He rejects some of the arguments for climatic changes in Egypt as fantastic (**1909**, p. 87) and apparently holds that there has been none during historic times in Egypt, Sinai, or Palestine. He considers, indeed, that the evidence from the Mishnah in regard to Palestine "seems a fairly complete answer to Mr. Ellsworth Huntington" (**1909**, p. 10).

6. Greece.

After Palestine and Egypt, the Mediterranean country of which we have the oldest records is Greece; and the claim that its climate has become drier has been made in an interesting paper by Prof. Huntington on "The Burial of Olympia" (**1910**). The site of Olympia in western Greece, when excavated thirty years ago, was found to have been buried beneath 15 to 20 feet of silt; and according to Prof. Huntington, this material was deposited in a succession of floods, which began after the year 400 A.D. The process was accompanied by landslips and earthquakes; but there is now no river capable of flooding the country, and the local stream is excavating a channel in the silt instead of adding to the silt layer. Prof. Huntington explains the facts by the assumption that sometime after the year 400 A.D., the rainfall must have been heavier and the rivers larger in this part of Greece. Further, he urges this was not the only change in the climate of Greece, for he has adopted, in a modified form, the theory proposed by Mr. W. H. S. Jones (see *e.g.* **1909**) that the moral and intellectual decay of the Greeks was due to malaria having become endemic in the country. In Prof. Huntington's view, somewhere between 400 and 300 B.C. the climate became more arid, so that the rivers, instead of being perennial, were reduced to pools, which formed the breeding-places of malarially infected mosquitoes. A similar change is thought to have started the decadence of the people of Italy about two hundred years later.

The evidence of climatic changes in Greece during historic times appears quite inadequate. Olympia, according to an alternative theory, was buried by floods from Lake Pheneos; this explanation has been accepted by high classical and geographical authorities, such as Prof. E. A. Gardner,* Prof. A. Philippson, and Mr. D. G. Hogarth,* and it does not require any climatic change. Prof. Huntington's conclusions are opposed to the facts discovered by the excavations under Curtius and Adler. According to his theory Olympia was buried by floods due to the increased size of the adjacent rivers in the sixth and seventh centuries. The last festival of Olympia was in 393 A.D.; a few years later, early in the fourth century, the Temple of Zeus was used by the Byzantine Christians as a fortress, and they built walls beside it and a church on the site

* In discussion of Huntington, **1910**, pp. 677, 680–681.

of the workshop of Pheidias. This church, according to Adler (in Curtius and Adler, vol. 2, p. 103), was built in the year 426, and probably remained in use until its overthrow by earthquakes, along with the Temple of Zeus, in the first half of the sixth century; and, as Prof. Huntington remarks, the coins found indicate that the site was inhabited till the seventh century. The German excavations have shown that the burial has taken place slowly and was in progress for a long time; for the older Greek foundations are covered by the remains of later Greek buildings; and these in turn by Roman buildings. The Roman remains are covered by a Byzantine surface, which, according to the dates given by Adler, belongs to the fifth and sixth centuries and lasted on till the seventh. In some places most of the silt which covered the Greek ruins was deposited before the Byzantine occupation, and therefore was laid down before the fifth century; while in other cases the bulk of the material is above the Byzantine floor, and has been deposited after the sixth century. That the accumulation of the silt was spread over a long period and was not mainly due to floods in the sixth and seventh centuries is illustrated by the sections, Figs. 1 and 2, which are based on those of Dörpfeld (in Curtius and Adler, vol. 1, p. 147; and Tafelband, 1, pls. cxxv. and cxxvii.). Huntington says (**1910**, p. 662) that it is unknown how long the floods continued; but on p. 667 he refers to the rapid accumulation as being in the sixth and seventh centuries.

The view, that the decline and fall of the Greeks was due to physical changes, is an interesting suggestion of the way in which geographical factors may influence national character; but the explanation can hardly be accepted while so high a classical authority as Prof. Haverfield * holds that the change in the Greeks did not occur at the date of Prof. Huntington's assumed climatic change. That the climate of Greece has remained unaltered since the date of the earliest records, is maintained by many classical authorities.† Mr. Hogarth says that Greece was a dried-up country

* In discussion of Huntington, **1910**, pp. 677, 680–681.

† Mr. A. W. Gomme has kindly given me the following note on references indicating that Greece in ancient times had a dry climate and that its rivers were mostly winter torrents.

"Pausanias, ix. 33: The river Triton (in Bœotia, north-west of Lebadeia) is a small winter torrent. Pausanias, x. 37: River Herakleion (in Phocis on the south coast) is a winter torrent. This is no more than they are now. Pausanias, i. 38: Pausanias says that the Cephissus by Eleusis is more impetuous than the Athenian Cephissus. Although the latter never dries up in summer, as does the former, it also is much smoother and never overflows its banks and creates floods, as does the Eleusinian. Pausanias does not call the Ilissus a winter torrent, which it is now (nor does Strabo).

"Strabo (p. 400) says that the Athenian Cephissus does dry up completely in summer. This may be merely a mistake, for Strabo is often inaccurate in his details of Greece; or he may have been deceived by the fact that most of its water was diverted to gardens, as it is now, and so does not reach the sea.

"The traveller called Pseudo-Dicæarchus (about 270 B.C.) says that Athens is dry and ill-supplied with water (§ 1).

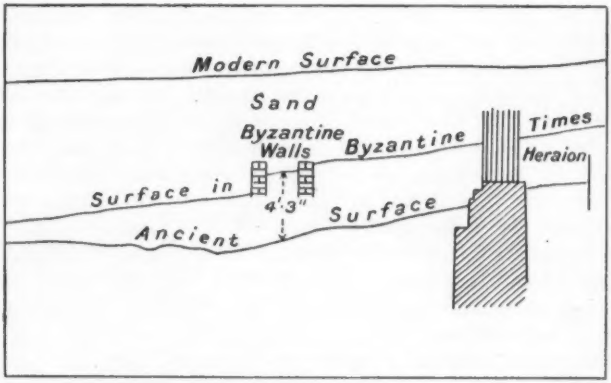


FIG. 1.—SECTION THROUGH THE RUINS OF OLYMPIA IN THE NORTH-EAST CORNER OF THE TOWN, SHOWING THE EXTENT OF BURIAL IN PRE-BYZANTINE AND POST-BYZANTINE TIMES.

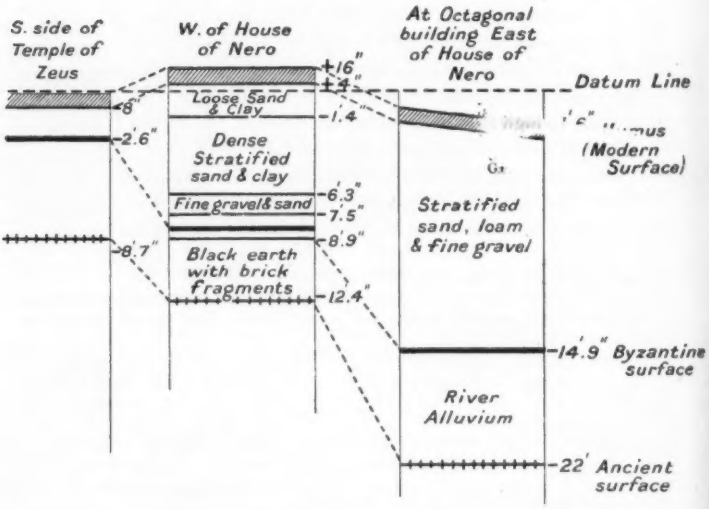


FIG. 2.—COMPARATIVE SECTIONS ON A LINE ACROSS THE SOUTHERN PART OF OLYMPIA, SHOWING THE RELATIVE DEPTHS OF THE BYZANTINE AND ANCIENT SURFACES.

in the fifth century B.C. He represents (p. 677) the climate of Greece in very ancient times as similar to that of the present day, so far, he says, as can be judged from the ancient authorities. This conclusion is also emphatically and authoritatively stated by D. Eginitis, the Director of the Athens Observatory. He states, "The comparison of climatic information, found in the different ancient writers, with systematic modern observations, shows that the thermometric phenomena of the climate of Athens have remained the same since ancient times. The dates of extreme temperatures, the seasonal thermometric characters, the dates of the beginning and end of the seasons, and generally the different phases of the progress of the temperature at Athens have not changed from ancient times to the present" (Eginitis, **1898**, p. 82). He supports this conclusion by reference to the date palm, which grew in Athens in the time of Theophrastus, though the fruits did not ripen; this fact indicates a climate with a mean annual temperature of a little above 62° F.; and the mean annual temperature of Athens is now, according to Eginitis, 63° F. (17·27° C.). Eginitis indeed asserts: "One can then accept as probable that the temperature of Athens has not changed since ancient times to our day even by one degree" (*i.e.* Centigrade) (Eginitis, **1898**, p. 84).

The same test shows that the climate of Cyprus has also remained constant, as according to Theophrastus dates were formed there, but did not fully ripen, and they do the same to-day.

That Greece, like other Mediterranean countries, had a wetter climate during the glaciation of north-western Europe is indicated by various facts. As an example I may refer to the identification by Prof. Gunnar Andersson, the Swedish botanist, of the fossil leaves of *Rhododendron Ponticum* in some calcareous tufa from the island of Skyros to the east of Greece (**1910**, pp. 145–9). This plant grows native under warm, humid conditions; its main home at the present day is in the wet region along the eastern shore of the Black sea, where the annual rainfall varies from 94 inches a year at Batum to 40 inches. The plant lives in three isolated localities in southern Spain and western Portugal, where the rainfall is over or but little below 40 inches. It has also been found as a fossil in

"Pausanias (viii. 22) says that Lake Stymphalus in Arcadia always dries up in summer (it is formed by the overflowing of a river that was only an underground outlet and flows plenteously throughout the year). Now it is variable, but hardly ever dries up (according to Fraser).

"The same Pseudo-Dicæarchus (§ 21) has this description of the climate of Thebes [Greece] (which I can vouch for): 'It is one of the best places to pass the summer in, for it has gardens and plenty of cool water. Besides, it is breezy, its aspect is verdant, and fruit and flowers abound. But it lacks timber, and is one of the worst of places to winter in by reason of the rivers and the winds, for snow falls and there is much mud.'

"Lastly, Plutarch (De Def., Orac., § 8), talking of the depopulation of Greece in his day, says you can walk over all Mount Ptoon (Eastern Bœotia) and not find a single shepherd, which indicates that it was not wooded then more than it is now. It is one of the barest of mountains, growing only low scrub."

recent deposits at Hötting in the Tyrol, near Innspruck, and at Skyros; and its occurrence at these five isolated localities indicates that the plant was once widely distributed along the shores of the Mediterranean. At the present time, most Mediterranean localities with a rainfall adequate to its needs are at levels too high and therefore too cold for the plant to exist; so that formerly the lowlands must have had a rainfall of about 40 inches a year.

The presence of *Rhododendron Ponticum* in Skyros is therefore evidence of a wetter time in Greece during the deposition of the calcareous tufa; but that time is referred by Gunnar Andersson to the "Glacial and inter-Glacial period in the Alps" (**1910**, p. 149), so the plant was probably extinct in Greece in prehomeric times.

7. Cyrenaica.

Opposite Greece, in northern Africa, rises the limestone plateau of Cyrenaica. In 1908, the contrast between the present conditions of the country as I saw it and the statements as to its importance in classical times naturally suggested that it had suffered a great diminution in its water supply. Many of its deep gorges were doubtless excavated at a time of heavier rainfall than the country now receives; but these gorges were made during the prehistoric pluvial period, of which there is clear evidence in many localities around the southern Mediterranean. The erosion of the deep valleys of Cyrenaica must have been long prehistoric, for they were cut almost to their present depth before the days of Palæolithic man. Comparison of the present condition of the country with ancient descriptions drove me to the conclusion, that there has been no appreciable change in the climate of the country since the earliest records. The very extensive waterworks established by the Romans and the innumerable terraces which they built in order to secure the best possible use of the scanty supplies of water show that cultivation then was much curtailed by the rainfall. It has been suggested by Prof. Myres (**1910**, p. 679) that these works represent the effort of the population to maintain their hold over the country in spite of a dwindling rainfall; but I had already considered that possibility and found no evidence in its favour. We saw no evidence that there had been a greater rainfall or a larger yield of the springs in Cyrene in the times of the early Greek colonists than in the time of the Roman occupation.

In a paper on the geology of Cyrenaica (**1911**, pp. 611–12), I have previously remarked that there is not "the slightest physiographic evidence of any considerable change in the rainfall or water-supply of Cyrenaica since the days of the Greek colonization in the seventh century B.C." This conclusion is based on the identity of the ancient and modern natural products, on the plagues of locusts which led to elaborate laws for their destruction, on the care taken to store small quantities of water, on the absence of wells from the port of Ptolemeta which was dependent for

water on an aqueduct, on the ancient political importance of the existing springs and the apparent concentration of the ancient population around them, on the occasional famines, on the desert nature of the country to the south through which caravan routes led to the oases of Aujila and Siwa, and on the fact that, according to Strabo's account, the distribution of the vegetation in the country was similar to that of the present day.

That the climate in Tunis has undergone no change since classical times has been maintained by Dr. Joseph Partsch (**1889**) in a review of some literature on Tunis. He holds that the lakes without outlets in Tunisia show that the water supply has not decreased since Roman times. For these lakes were not then essentially fuller than they are now, and he holds that the uniformity of the climate is confirmed, amongst other facts, by the ancient trade routes. The increased desiccation of the Sahara in historic times is denied by Schirmer (**1893**, pp. 120–138), in his interesting discussion of the question.*

8. Northern and Western Europe.

The evidence from northern and north-western Europe is less instructive than that from the Mediterranean countries as the historic records are shorter. If there had been any important change we might expect to find some trace of its progress in Europe during the last 1800 years. The evidence available, however, gives no adequate proof of any decrease in the rainfall.

Such evidence as I know as to the conditions of the British climate in Roman times indicates that it was essentially the same as at present. Tacitus, in his 'Life of Agricola' (chap. xii.), says of Britain, "The soil, with the exception of the olive and the vine, and other productions accustomed to grow in warm climates, is fruitful and fertile; its products are slow in maturation, but quick in growth; the same cause exists for both, the great humidity of the soil and of the climate." Judging from the foundations of the Roman bridge near Chollerford, the Roman catchwater drains on the Fens, and the positions of various Roman camps, the British rivers in Roman times were no larger than at present, and the rainfall was therefore probably not materially more abundant.

It is generally recognized that any past changes of climate could most readily be recognized from the records of severe winters; for the freezing of rivers and arms of the sea would be more likely to be recorded than any other meteorological event of equal significance. Some authorities, such as Reginald Thirlmere, assert that important changes in climate have occurred. According to his view, as previously quoted, a climatic change set in about the beginning of the Christian era. The temperatures became higher until the year 1250. Since then the climate has again become colder, and therefore we may presume wetter, and will

* For later literature with the same conclusion see Lahache (**1907**).

continue until the maximum cold is reached in about four hundred years' time.

There have been many enumerations of the cold winters. An oft-quoted passage in Gibbon (chap. i.) suggests that the Rhine and Danube were more often frozen in Roman times than they are now. But Arago, who has given a long catalogue of the freezing of European rivers and seas from 860 to 1829, denies (**1833**, p. 216) that any one could recognize in it any proof that the climate of western Europe has deteriorated during this period. He refers to Strabo's statement as to the northern limit of olive cultivation in the Cevennes and says "that limit is to-day at the same place" (**1833**, p. 220).

Köppen has discussed (***Met. Zeit.***, **1881**, pp. 183–194) the European records of the past thousand years and claims that there is a cycle of severe winters which runs its course in about 130 years. Ehrenheim, in a book published in 1824,* showed that the sea between Scandinavia and Denmark was more often frozen between the eleventh and fifteenth centuries than it has been in recent times, and also that the Bosphorus has not been frozen over since 1621 (**1824**, p. 197). The conclusion from the facts quoted by Ehrenheim appears to indicate that the European winters are now milder than formerly; and this conclusion is supported by Dr. Ekholm's comparison (**1901**, p. 52) of the observations made by Tycho Brahé on a small island in the Sound off Denmark from 1582 to 1597, with those made at the same spot between 1881 and 1898. These observations indicate that both the summers and winters are now more moderate, while the temperatures of spring and autumn are unchanged. The climate of Denmark and southern Scandinavia has, in fact, simply become more maritime, and less continental; so that the summers appear to be now cooler and the winters warmer. That our summers have become colder has been frequently asserted from changes in the cultivation of the grape. The vine was once cultivated for wine-making in England and some parts of northern France where it is not now grown. The abandonment of the cultivation of the vine in England does not imply any climatic change. It is adequately explained by the improvement in communications, and the cheapness with which fruit and wine can be brought to the northern markets. In the Middle Ages, people were probably contented with worse wine and ate sourer grapes than they will consume now, when the superior produce from southern Europe can be bought at a cheaper price than the inferior local product.

If there had been any material change in the natural conditions of vine cultivation it could doubtless be recognized from the records of the vine cultivation in the chief vine districts of France. The date of the beginning of the wine harvest is known for the last five centuries. The

* For loan of a copy of this work, which I have not been able to find in any British library, I am indebted to Dr. J. Gunnar Andersson. Some extracts from it are quoted by Ekholm, **1901**.

lessons taught by these records have been frequently discussed; and we have the emphatic opinion of so eminent a meteorologist as Angot that the evidence shows there has been no progressive change, but only a slight oscillation in the conditions, since the reliable records began in the fourteenth century.*

9. Hungary and Rumania.

In central and eastern Europe there is well-known geological evidence opposed to the view that there has been any steady decrease in humidity since glacial times. For that once much controverted deposit, the loess, which is common in the well-watered valleys and plains of Germany, was formed under arid conditions similar to those on the steppes of central Asia. Opinion is not wholly agreed on all the problems connected with the loess; but it is admitted to be a post-glacial formation, and its fossils to be the remains of animals characteristic of dry plains or steppes, and it is generally believed that the loess was a wind deposit, laid down in a dry climate.† The formation of the loess has now ceased in many districts owing to the return of a moister climate. As Hungary is the most central country in Europe, it is the most likely to have been affected by any serious increase in the dryness of the climate; and the study of soils has there received special attention. Lake Balaton, as a great lake without an outlet, is the best natural rain gauge in central Europe; and though its level has been higher than it is now, Prof. de Cholnoky tells us (**1910**, pp. 125–6) that it has also been lower. It gives therefore no evidence of progressive desiccation. Dr. Treitz, of the Geological Survey of Hungary, has discussed the evidence given by the alluvial deposits as to climatic changes, and he holds (**1910**, p. 137) that in recent geological times Hungary has passed through two periods moister than the present, but also through two drier periods.

Again, Dr. T. Kormos (**1910**, pp. 130–131) concludes from the evidence of the fossil mollusca, that the lower deposits in the loess of Hungary were laid down in a wetter climate; and the upper part in a climate that was hardly different from that of to-day. He suggests that the slight recent changes are due to the spread of cultivation and not to the climate. The various Hungarian authorities do not wholly agree; and Dr. L. de Lóczy insists that no general conclusions can be applied to the whole of Hungary (**1910**, p. 119), and points out that the changes are often local. But all the east European evidence agrees that there has been no appreciable drying of the climate during historic time.

The evidence from Rumania is especially significant, since if desiccation has been in progress along a wide belt across central Asia from Turkestan to the Caspian, some trace of this change might be expected further

* For references to the literature on this subject, see Hann, **1910**, vol. 1, pp. 352–353.

† Some loess is probably rainwash, and it may include some layers of aqueous origin.

west, and Rumania would be one of the European countries most likely to have been affected. Fortunately the recent geological history of that country as shown by the alluvial deposits and old soils on the plains of Rumania has been carefully examined and the results have been recently summarized by Dr. G. Murgoci of Bukharest. He considers that there have been two oscillations of climate in post-glacial times and that another is now in progress (Fig. 3); these oscillations are best marked inland and are much smaller in the eastern provinces on the coast of the Black sea in

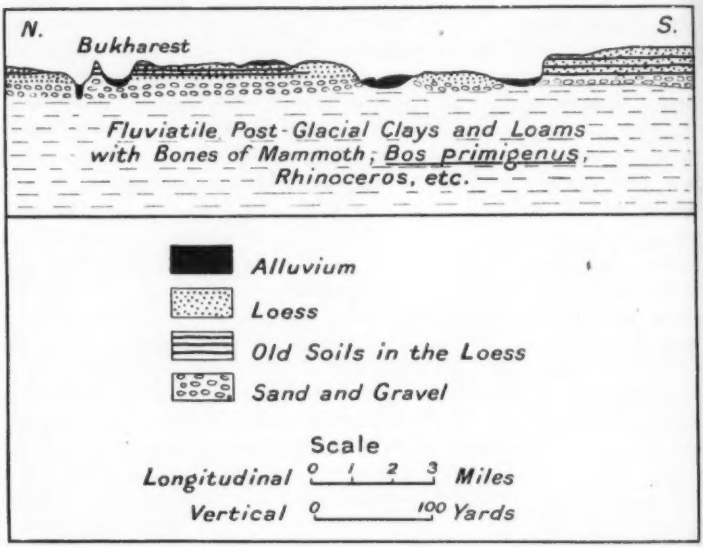


FIG. 3.—SECTION ACROSS THE DANUBE VALLEY NEAR BUKHAREST, SHOWING THE DEPOSITS OF A MOIST PERIOD SUCCEEDING AS WELL AS PRECEDING THE LOESS (ARID DEPOSIT).

Bessarabia, Moldavia and the Dobruja. The oscillations began in post-glacial time with the development of a more temperate and wetter climate, during which were produced, owing to the severity of the summer drought, the drab alkali (Serazimon) and red soils. A second oscillation brought back another wet period and the formation of the black soils. Then followed a short dry desert period in the Muntenian plain and on the Moldavian plateau; and it was succeeded by the moister climate of the present day. Dr. Murgoci concludes from the evidence of soils, of the Roman remains and prehistoric tumuli, and of the vegetation, that the Rumanian climate is becoming moister, for the woods and forests have spread and are still spreading over land that was formerly arid steppe (**1910**, p. 165).

(*To be continued.*)

THE IMPERIAL TRANS-ANTARCTIC EXPEDITION, 1914.

By Sir ERNEST SHACKLETON, C.V.O.

Objects of the Expedition.

1. My object is to cross the South Polar Continent from sea to sea—from the Weddell sea to the Ross sea. The crossing of the South Polar Continent will be the biggest Polar journey ever yet attempted. It is a longer journey than to the Pole and back, and the first 800 miles will be on quite a new route, and with good fortune it is probable that the whole journey may be on entirely new ground. The minimum distance from sea to sea is about 1500 geographical miles—that is roughly 1700 statute miles.

2. From a geographical point of view, the complete continental nature of the Antarctic can be absolutely solved by such a journey. No one knows whether the great plateau dips gradually from the Pole towards the Weddell sea, and no one knows whether the great Victoria chain of mountains, which has been traced to the Pole, extends across the continent and links up with the Andes. The solving of this problem is of intense interest to geographers all over the world, and the discovery of the great mountain range, which we assume is there, will be one of the biggest geographical triumphs of the time.

3. The geological results will be of the greatest interest to the scientific world. The expedition will at its winter quarters make geological collections; also typical rocks will be taken on the journey if we come across exposed rocks when crossing the mountain ranges. One ship will land parties for the purpose of making geological collections on the west side of the Weddell sea, and the ship will at the same time trace, if possible, the continuation of Graham Land southwards.

4. The expedition will take continuous magnetic observations from the Weddell sea right across the Pole, and the route followed will lead towards the Magnetic Pole and make an ideal method of determining the general dip of the magnetic needle. This magnetic work has a direct bearing on economic conditions, in that an absolutely true knowledge of magnetic conditions is of use to ships in navigable waters. I also propose to set up a magnetic observatory at winter quarters and take continuous magnetic observations throughout the winter. On my last expedition we could only take field magnetic observations, as, owing to lack of money in the first place, I could not afford to provide a large magnetic equipment, though we did important work, as one of the parties reached for the first time the South Magnetic Pole.

5. The meteorological conditions would be carefully studied, and would help to elucidate some of the peculiar problems of weather that at present are only dimly recognized as existing. Continuous meteorological observations, both at winter quarters and on the journey across, are of

extreme importance, and the results can be correlated with the observations of the last three expeditions in the Antarctic.

6. Biological work will be thoroughly carried on, and the distribution of fauna and plant life will be studied. Both ships will be equipped for dredging and sounding.

7. All branches of science will be most carefully attended to, and the nett result scientifically ought to be a large increase to human knowledge; but, first and foremost, the crossing of the Polar Continent will be the main object of the expedition. The unknown fields to conquer are rapidly narrowing down in the world, but there still remains this great work.

Method of Conducting the Expedition.

8. I do not propose in this statement to go fully into the method of carrying out the expedition. It must be allowed that my experience and knowledge of Antaretic affairs are sufficient to warrant the matter being seriously thought of.

9. The main feature of the expedition will be that a party of six men will undertake the trans-Antarctic journey, with one hundred and twenty dogs, two sledges driven by aeroplane propellers with aeroplane engines, and an aeroplane with clipped wings to taxi over the ice.

10. The second in command of the expedition will be Frank Wild, a first-class surveyor, who was with Scott in 1901–1904, was on the Southern Journey with me 1907–1909, made the big journey on the Australasian expedition, 1910–1912, and who is one of the very best modern Polar explorers.

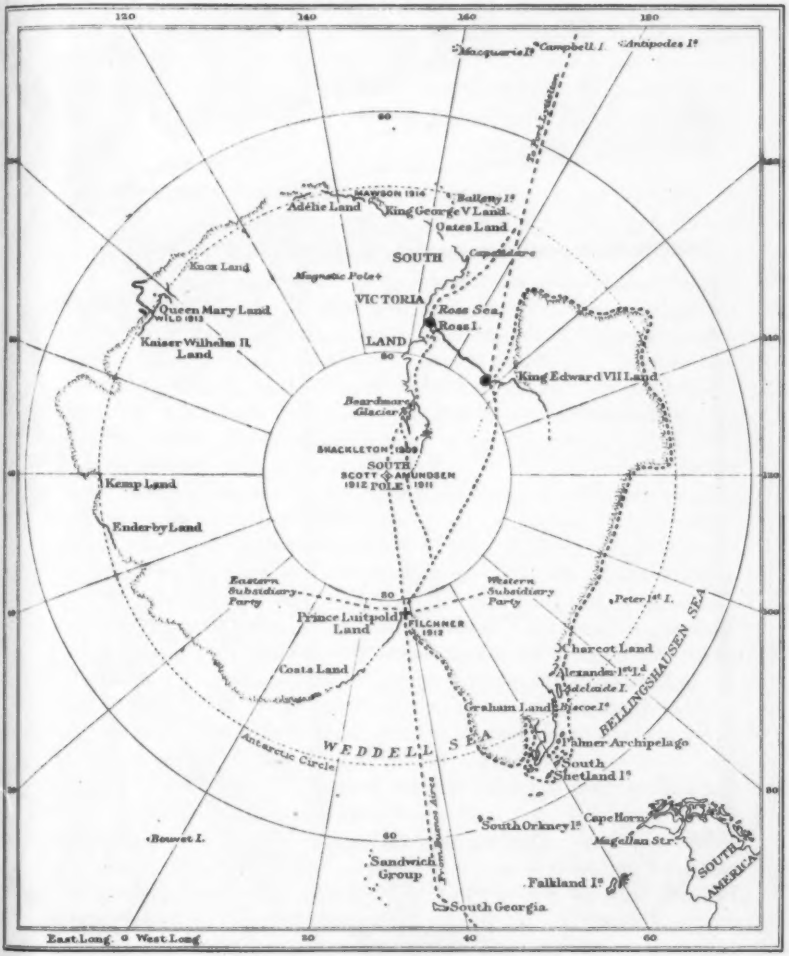
11. In addition to the six men who will comprise the trans-Antarctic party, I shall have a trained biologist, geologist, and physicist attached to each ship of the expedition. It is possible that in the case of the first ship that goes down to the Weddell sea, these three men will be stationed at winter quarters in the Weddell sea, and in addition there may be another party of three to explore the land to the east of our winter quarters, which is entirely unknown. This largely depends on funds; the more money I have for the expedition the more I can enlarge its scope so as to embrace in the one expedition as many units for sledging as possible. During the summer months the first ship will navigate from winter quarters round towards the Ross sea.

12. I propose to have 120 trained dogs, obtained from Alaska and Siberia, taking teams used to post work, as these are the best dog teams, and it was with dogs of this kind that Amundsen made his wonderful speedy journey in which he gained the South Pole. The arrangement of the teams, and amount of weight, etc., dragged by the dogs are details which have been worked out, but which it is not necessary to allude to here.

13. In the last three years the aeroplane engine has reached what we may call absolute efficiency. Motor sledges in the ordinary accepted

SOUTH POLAR REGIONS

Showing the proposed routes
of the
TRANS-ANTARCTIC EXPEDITION
1914



Scale 1: 60,000,000 or 1 Inch = 947 Stat. Miles

Reference

Tentative routes shown thus ---------

" *winter quarters* ..... ✚

" *departure bases* ..... ●

term are practically useless in the Antarctic, as the amount of work put on the engine when passing over varying surfaces generally causes the motor to break down. I propose, therefore, to have an ordinary sledge, only larger than the usual size, with an aeroplane engine mounted on it, and an aeroplane propeller. I have had the pulling power of such a machine worked out, and find that a sledge of this description is capable of dragging 2000 lbs. weight at the rate of 5 to 6 miles an hour. I would propose to have two sledges built and thoroughly tested during the winter out in Siberia or the north of Canada under similar conditions to the Antarctic. These two sledges would be in the charge of experienced motor drivers.

Programme of the Expedition.

14. The expedition will leave Buenos Aires early in October, 1914, and push to the Antarctic, reaching, if possible, 78° S. lat., where a good landing-place was discovered by the German expedition. If the ice conditions are favourable, and it is possible to reach 78° S. and make a good landing by the beginning of November, the shore party will land and proceed immediately across. Once the pole is attained from the Weddell sea, the rest of the journey from the Pole to the winter quarters on the Ross sea will not be difficult. Should we not be able to arrive at the land in the Weddell sea early enough, we should make permanent winter quarters and lay out depôts before the winter, crossing the continent the following season. The first ship in this case will continue working in the Weddell sea and on the Graham Land coast, and when the season is too advanced for more work to be done, she will return to South America and continue in the following season, when she will pick up the Weddell sea party. The second ship will leave New Zealand, land a party in the Ross sea to meet the trans-continental party, and the trans-continental party will return in the second ship to New Zealand.

15. Although the journey seems a very long one, I feel that it is possible to accomplish the transcontinental journey in five months under favourable conditions, but in order to be prepared for all eventualities, I shall have the base in the Weddell sea to fall back upon should the obstacles be insurmountable the first season.

16. This, briefly, is an outline of the programme of the expedition. There will be two ships. The full complement of the shore party will be twelve men; the complement of the two ships will be thirty men—total forty-two. Both ships will be fitted to burn oil instead of coal; by the use of oil we shall greatly extend our radius of action and be independent of ballast, for when the oil is used up water can be pumped into the tanks and the ships can sail, thus obviating the previous difficulties of expedition ships, and we shall be able to stay at sea much longer. Both ships will also be fully equipped with cages and tanks for bringing home live penguins and seals, which have never yet been taken from Antarctic regions,

and I am convinced that it only requires a certain amount of care to bring home live specimens, especially the young.

17. I hope to give in another issue of the *Journal* more complete details of our expedition, but this is an outline which is subject to modification or extension—modification of the actual line of route, or change of the actual line of route; extension if sufficient funds allow me to increase the number of men or increase the number of sledge parties.

Since I formulated the above plans I have had an opportunity of consulting with the President of the Royal Geographical Society and other well-known geographers, and the consensus of opinion on their side—an opinion which I may say I am prepared to adopt—is that more benefit would ensue by not taking one of my tentative routes, *i.e.* that from the Pole behind the Victoria chain of mountains coming out at the position of Mount Melbourne, but rather that I should, if possible, take another route over to the eastward of Amundsen's track, or between our route, Beardmore glacier route, and Amundsen glacier route; thus the entire ground would be new. Of these two new routes, undoubtedly the eastward one—if it can be done—is the most interesting, but a great deal would depend on the state of my equipment and the condition of the men by the time we reach the diverging point. This matter must finally be settled before I leave, or at any rate the arrangement for the depôt on the Ross sea side must be defined as regards latitude and longitude, so that, supposing I took any one of the three alternative routes, ignoring entirely the inland Victoria route, I should be able to pick up this proposed depôt.

There is hardly time now to go into this question, but I may say that the advice of the eminent geographers as regards this matter, weighs so considerably with me that I have determined not to pursue the original route inside the Victoria chain of mountains.

Letter from Lord Curzon.

The Right Hon. Earl Curzon of Kedleston, G.C.S.I., G.C.I.E., President of the Society, has addressed the following letter to Sir Ernest Shackleton:

"I have read the letter and memo. that you have sent me with the warmest interest, and have no hesitation in expressing my hearty approval of the plans that you have sketched.

"When in my address in May I spoke of crossing the South Polar area from the Weddell sea to Ross sea, I hardly contemplated that any explorer would so soon essay the task. But that it is a work worthy to be taken in hand cannot be doubted; that it ought to be undertaken by an Englishman is to me quite clear; and that of living Englishmen you are the best fitted by training, knowledge, experience, and prestige to carry it to a successful issue, none will be found to deny.

"So far, therefore, as my personal sympathy is concerned, you may rest assured of that; and I apprehend that at a later date when you place your

views before the Council of the R.G.S. they are in the highest degree unlikely to take a different view.

"Quite apart from the contributions to geology, meteorology, and biology that may result from such an expedition—organized and equipped as it would be by you—the feat of crossing the Polar zone from sea to sea, and of discovering what lies hidden in that great white blank, whether of mountains, or glaciers, or frozen plateaux, or icy plains, appeals to the imagination as one of the few great achievements in exploration that are still open to the human race—a greater achievement, indeed, than any yet recorded in the history of the Antarctic or the Arctic.

"With these few words, permit me to offer you my heartiest wishes for your success, and to express a hope that you may receive that financial support without which so considerable a venture cannot be fairly or profitably undertaken."

Grant from the Society.

At the meeting of the Council of the Royal Geographical Society, on January 12, it was resolved to make a grant of £1000 towards Sir Ernest Shackleton's Trans-Antarctic Expedition.

CARTE INTERNATIONALE DU MONDE AU MILLIONÈME.

In the four years which have passed since the first International Map Conference assembled in London, about a dozen sheets have been produced, and the experience gained in their production has shown the desirability of making certain changes in the conventional signs sheet and in the scale of layer colours. Moreover, the Conference of London included representatives of only those Powers which are represented by Ambassadors at the Court of Saint James; and there were reasons why it was desirable that other powers interested should have an opportunity of contributing to the establishment of a final scheme.

The French Government accordingly issued invitations to all the other governments for a second International Conference in Paris; and in response to this invitation the representatives of thirty-three countries assembled in the *Salle d'honneur* of the *Invalides* on December 10. The conference had a strictly official character, in that the delegates were formally accredited by their respective Governments, and the agreements reached will be submitted for ratification through diplomatic channels.

Of the twenty-one names at the foot of the London resolutions of 1909, nine are found in the list of delegates to Paris—Penck, Partsch, von Haardt von Hartenthurn, Brückner, Loczy, Cubillo, Close, Vidal de la Blache, and Lallemand. The full list of delegates to Paris contains fifty-seven names, including General von Bertrab (Germany), Colonel Jeanne

(Belgium), Colonel Sand (Denmark), Prof. Muller (Holland), General Gliamas (Italy), General Schokalsky (Russia), and Colonel Byström (Sweden). The British delegates were Colonel Close (Ordnance Survey), Colonel Hedley and Captain Cox (Geographical Section, General Staff), and Mr. A. R. Hinks (Royal Geographical Society), representing Great Britain; Major Tandy (Survey of India) representing India; and Major Richardson, representing New Zealand.

After a speech of welcome by General Laffont de Ladébat, representing the Minister of War, the presidential chair was taken by General Bourgeois, chief of the *Service géographique de l'armée*, and the meeting proceeded to "constitute its bureau" and the four commissions into which it was divided. The first, under the presidency of Prof. Penck, considered the conventional signs sheet; the second, under the presidency of Colonel Thiébaut, was responsible for colours and relief; the third, under Colonel Close, dealt with the distribution of sheets between the nations interested, and the principles on which they should treat undetermined boundaries. The fourth commission, facetiously referred to as the commission for considering irrelevant questions, had no occasion to meet. M. Emmanuel de Margerie and Captain Cox filled with distinction the laborious position of General Secretaries to the Conference.

The danger of a second conference was clearly the probability that it would wish to discuss everything afresh. To make this impossible the first full session devoted itself at once to specifying those resolutions of London which should be reaffirmed, and should not be subject to discussion at Paris. The arrangement of sheets, the projection, scales, and unit of heights were thus removed from discussion. Conventional signs, representation of relief, and the principles of partition of the work formed, then, the subjects of the conference of Paris.

Contrary to expectation, the conventional signs gave much trouble to the first commission, and it was only by the formation of a number of sub-commissions that they were able to get through their work and report in time to the general session. The classification of towns in particular proved to be a subject of unlimited possibilities for discussion. Should population or administrative importance be the deciding factor, and should the style of the lettering or the shape of the town sign be significant of one or the other? It soon became evident that no binding decision was possible. A town of 20,000 people has very different importance in Europe and in Africa, and it must be left to the country producing the sheet to classify its towns for itself, with the proviso only that the legend on the sheet margin shall explain the system which has been adopted.

More contentious, if not so difficult of resolution, is the question of the transliteration of place-names. A resolution of London provides that "in the case in which certain important localities have also, in addition to the official name, another customary name notably different, the latter shall be printed on the map under the official name." In accordance

with this rule the customary name Constantinople is given in brackets after Istambul on the sheet published by the British General Staff; and so long as the sheet is published by some authority far removed from local pride or prejudices, no difficulty will arise. The British draughtsmen did not introduce all the customary names for Constantinople, but only the British. The case is very different for a sheet of Eastern Europe, where any town may have several official names in as many official languages. Such cases cannot be legislated for, but that does not prevent spirited discussion at an international conference.

One great improvement in the new conventional signs sheet is the abolition of the double red line for roads. The solid line adopted will be much more legible on the layer tints. Railways, telegraphs, navigable rivers, canals, were all dealt with, and their signs revised in the light of experience; but it is impossible to describe what was done without a specimen of the finally adopted conventional signs sheet.

A matter of some importance, in view of the extensive literature which will grow up, is the official name of the map. By adopting the title "Carte internationale du Monde au millionème," the conference has given to cataloguers and indexers the opportunity of keeping together entries which might be scattered otherwise under unsatisfactory index words, such as "international." The word "Carte" is a good index word, and it will be convenient if all references to the map are gathered under its official title.

The work of the first commission, most important in detail, will not greatly affect the general appearance of the map; the second commission have made a great change, and it is hoped a great improvement, by their revision of the colour scale for layers and the new rules for contours. To take the latter first: it was laid down in London that the vertical interval between contours should be, in principle, 100 metres. In practice this is often impossible, and there was no guide to the choice of suppression; so that there might well have arisen great discontinuities between adjacent sheets. By the resolutions of Paris certain contours are obligatory—200, 500, 1000, 1500, and so on; the 100-metre contour is defined as extremely desirable, and the insertion or omission of the remainder is left to discretion, subject always to the provision that in principle the interval is still 100 metres. A similar convention governs the contours on the sea-bottom.

By the resolutions of London the land contours were brown, the sea contours blue, and the line of sea-level was shown brown on the characteristic sheet, but blue on all the published sheets. In practice the brown contours proved unsatisfactory on a layer map, modifying the layer tints and producing confusion. By producing an experimental edition of the Istambul sheet with fine black contours,* Colonel Hedley had no

* Copies of this and of other interesting experimental sheets are deposited in the Map Room.

difficulty in converting the commission to black contours for the land; and finally it was decided that all contours, on land, ice and snow, or the sea-bottom, should be black; a continuous line for the "courbes maitresses," the obligatory contours; a fine rouletted line for the others.

The London colour scale found but one or two defenders. In its place the commission adopted a new "gamme," not very different from the old up to 1000 metres, but running up thence into shades of pure carmine in place of the brown turning to magenta. Layer colours will cease at the line of permanent snow, and on the glaciers. The latter will be distinguished from snow-clad spurs by blue glacier lines, and by a special bluish shade where necessary. In cases where the relief of the permanent snows is not sufficiently shown by the contours, shade may be added to them at discretion. In fact, each establishment is given liberty to do the best it can, which is the only way towards a real solution of the problem. The colour scale for the sea was taken from the oceanographical atlas of the Prince of Monaco, who authorized his representative to announce that he would undertake the production of some of the ocean sheets.

The work of the third commission was of a more general and more delicate kind. The duty of preparing a sheet covering the territory of several powers equally capable of undertaking the work must necessarily be the subject of an exchange of views. A sheet extending from the territory of one such power to that of another not possessing sufficient cartographical resources falls naturally to the former. But in some parts of the world, particularly in Asia, there are whole sheets not provided for by this rule, which may yet be the subject of the ambitions of one, or perhaps more than one, power. In such cases the conference declined to lay down any rule. At this point the delegate of the Chinese Republic announced, to the admiration of all, that he was authorized by his Government to say that the General Staff at Pekin had established in all the provinces of China cartographical establishments charged with the production of the map, and that these operations are making steady progress.

The somewhat difficult question of undefined boundaries in South America was settled in a friendly conference between the representatives concerned, and the partition of Africa was agreed upon in principle.

Finally there came a resolution which must have much influence on the future progress of the map. The British delegation was authorized by the British Government to propose that a permanent central office should be established in England, with headquarters at the Ordnance Survey, and an auxiliary office in London. The office would have no executive authority, and its functions would be the publication of an annual report; the exchange of information; and the provision of useful data to all interested.

At successive plenary sittings the Conference adopted, generally with unanimity, the decisions of the various commissions, and with graceful acknowledgments accepted the proposal for the establishment of the

permanent office in England. On her part, Great Britain will cordially welcome the responsibilities entailed by this honourable outcome of her initiative in calling the conference of London.

The sometimes severe labours of the Conference of Paris were lightened by the traditional splendid hospitality of the French Government, of the City of Paris, and of many unofficial hosts. The delegates had the honour of being received by the President of the Republic; they were entertained magnificently at the Opera, and at a final banquet. The arrangements for their comfort made by the staff of the *Service Géographique* lacked nothing which forethought could supply; and the generous breadth of view which distinguished the conduct of General Bourgeois in the presidential chair was happily reflected in the cordial sympathy established between the representatives of France and of all other nations.

THE ALAI-PAMIRS EXPEDITION OF THE GERMAN AND AUSTRIAN ALPENVEREIN.

Mr. W. R. Rickmers, the leader of this expedition, has just returned home, thus closing a successful journey under the auspices of the German and Austrian Alpine Association, which supplied one-half of the funds; the total expenditure was £1350, for a party of eight people and a journey of seven months, including outfit. The members of the expedition were Dr. W. Deimler (astronomy and topography), Prof. H. v. Ficker (meteorology), Dr. R. v. Klebelsberg (geology), Dr. R. Kaltenbach (natural history), Frau Kaltenbach (portrait painting), Herr E. Kuhlmann and Mrs. Rickmers. From the account of the earlier part of the expedition given in the *Journal* for December (p. 570), it will be remembered that the explorers had reached a point a little above Garm, in the valley of the Vaksh or Surkhab (in Karateghin), whence an ascent of Sagunaki and other mountains of the Peter the Great range had been made.* The party afterwards proceeded to Tupchek, a little higher up the same valley, making this also a base camp for the thorough examination of the neighbouring mountains, with their glaciers and moraines. Ascents were made up to 5400 metres (17,717 feet), as well as side excursions up the Muksu valley and down to the Surkhab junction, where vast moraines were examined. The further march led by Little Tupchek and across the Gardani Kaftar pass to Kalai-Lojirk, in the valley of the Khingob, on the south side of the Peter the Great range. After various excursions and glacier studies the expedition went by Vanj to the valley of the Panj (upper Oxus), returning to Kalai-Lojirk by another route. The party then divided, one half returning to Samarkand by way of the lower

* The height of Sagunaki is now given by Mr. Rickmers as 4900 metres (16,076 feet), instead of 5100 metres.

Khingob, Diushambe, etc.; the other going south-west by Muminabad to Kabadian, and continuing by the usual route *viâ* the Irongate to Bokhara city.*

The plains and valleys of this region are well known, though still offering many curious problems. The Russian 5-verst map (1 : 142,000) is good, as far as situation and communications are concerned, but the high mountain topography is practically (and probably intentionally, for want of time) neglected. In this respect the expedition found an extensive field of action, the main result being a photogrammetric survey of the glaciated ranges between the Surkhab and Khingob rivers: A detailed photographic survey of the whole of the Borolmas moraines (old and recent) was also made, while about thirty full-plate panoramas will show the morphological and orographical detail of various landscapes along the route. Many new glaciers were discovered, and an entrance effected into the mysterious Daraigharmo or valley of the upper Khingob, where the travellers ascended a mighty glacier close up to the foot of Mount Sandal. The heights of peaks west of Altin-mazar were found to have been overestimated by previous explorers, but Mount Sandal (7000 metres, or 22,960 feet, by triangulation from a base determined by boiling point and by reference to previous points) and its neighbours made good their earlier claims. Over thirty summits were climbed, ranging from 2200 to 5200 metres (7220 to 17,060 feet), chiefly for topographical purposes. Attempts at fixing longitude by occultations may be expected to give correct results after final calculation.

The geological results are rich and manifold. Among items of general interest may be mentioned an important fault which coincides with the Surkhab valley along a great part of its length, and which evidently has some connection with the earthquake region between Andizhan and Karatagh. Many valuable profiles were obtained. As to glaciology, one may confidently state that the expedition has obtained one of the most instructive additions, of latter times, to general and climatic glaciology. An unexpectedly low level of former ice-periods was established beyond a doubt. The larger glaciers are characterized by long "dead" snouts, and the old moraines (mostly rather recent, *i.e.* later than the Würm period) are very beautiful.

Among other items may be mentioned the discovery of a cave (known to the natives) with historic, archæological, and possibly prehistoric remains. Mountain insects (chiefly butterflies). ibex horns, etc., were collected, and the occurrence of a kind of markhor was established on the right bank of the Oxus. A series of colour photographs were taken by Herr Kuhlmann (who died a fortnight after his return home from a dangerous, and, it appears, undefinable disease, a complication of jaundice and typhoid with malarial symptoms). Many types of men and especially

* The route may be followed approximately in Mr. Rickmers' map, *Journal*, vol. 30, p. 468.

women were drawn by the painter. Meteorological results were as good as the short and broken records of such a journey will allow, but the skill of such a trained observer as Prof. Ficker will admit of many interesting conclusions.

The expedition was devoid of sensational incident or exciting discoveries, but produced a rich harvest of scientific data. The Russian Government and the Amir of Bokhara gave most hospitable assistance, and the leader is also indebted to the Grand Duke of Oldenburg and Prince Oldenburg for most valuable introductions.

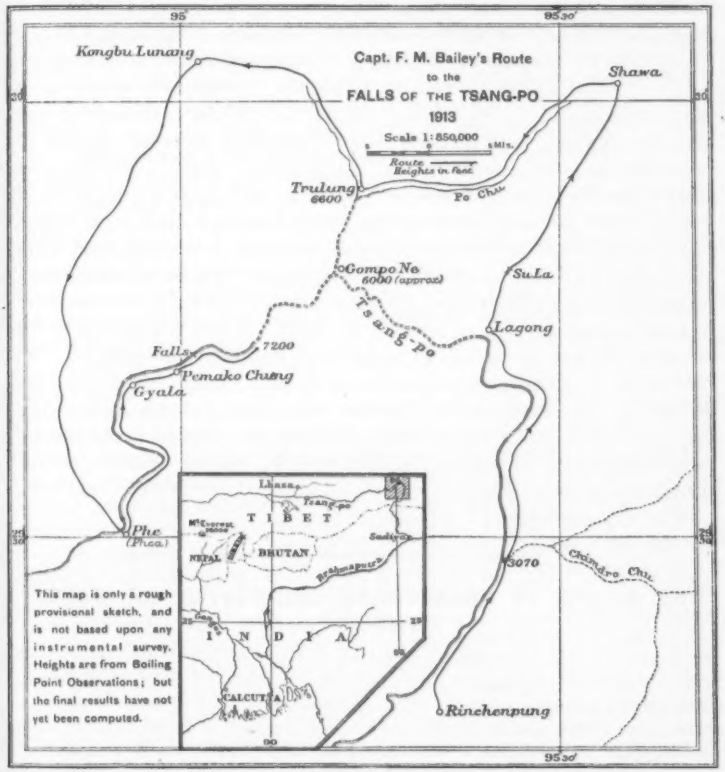
NOTE ON THE EXPLORATION OF THE TSANG-PO.

By Captain F. M. BAILEY.

[CAPTAIN BAILEY sends us the following short account of his recent journey with Captain Morshead to explore the hitherto unknown portion of the Tsang-po where it breaks through the main range of the Himalayas. He says nothing here of the route by which he reached Rinchenpung (a village with a monastery visited by Kinthup and shown on the map accompanying his report), but from his former letter quoted in the *Journal* for November last (vol. 42, p. 491), it appears that he and his companion had crossed the mountains from the upper valley of the Dibong. Rinchenpung is considerably higher up the Dihong valley than the furthest point reached during the Abor expedition (roughly 29° N.; see Mr. Bentinck's map in *Journal*, vol. 41, p. 200), but it is known that surveys have since been continued by various parties, and the monastery may have been reached by some of these. The accompanying map has been compiled from the scanty material hitherto existing, in order to help to an understanding of Captain Bailey's text, but it must be regarded as merely provisional. Some of the places named have appeared in no previous map, though several were mentioned by Kinthup, whose route it should now be possible to follow with more precision than hitherto. One result of the recent explorations is to show that the confluence of the Nagong (or Po) Chu (the source of which was touched by A-K during his journey of 1879–82) is much further north than was once supposed. It will be noticed that about 45 miles of the course of the Tsang-po remain unvisited, but the result of Captain Bailey's inquiries seems to leave little doubt as to its general character even here. Captain Bailey writes:]

We followed the Tsang-po valley from Rinchenpung up to the village of Lagong, but no altitude in the river-bed was obtained higher up-stream than the confluence of the Chimdro Chu with the Tsang-po, a point some 40 miles by road below Lagong; the altitude of the river by hypsometer at this point was 3070 feet. At Lagong we left the Tsang-po, and, crossing a pass, the Sula, entered the valley of the Nagong Chu, here called the

Po Chu. This river was followed from Showa down to Trulung (Kinthup's "Poh-toi-lung"). The altitude of the river at Trulung was 6600 by hypsometer. We wished to follow this river down to its junction with the Tsang-po at Gompo Ne, but were prevented, as the rope bridge had been carried away; the height of the Tsang-po at Gompe Ne must be about 6000 feet, or some 600 feet below Trulung. From Trulung we



followed Kinthup's road as far as Kongbu Lunang, from which place we took a more direct route to Phe (Phea) than that followed by Kinthup. We then went down to Gyala, opposite which is a waterfall on a small tributary, in which a god, Sinji Chogye, is carved on the rock behind the cascade.* The god is only visible in winter when the stream is small.

* These falls would almost seem to be responsible for the reports of falls on the Tsang-po itself—both those described to Colonel Waddell, of which a native drawing was reproduced in the *Journal*, vol. 5, p. 259, and those mentioned by Kinthup. The drawing showed the "god" carved on the rock, and Kinthup spoke of the cliff as Sinji Chogyal.—[ED.]

From Gyala we went down to Pemako Chung, a small lamasery which was visited by Kinthup. Near this are the falls which he described. The river nearly the whole way from Gyala to this point is a foaming rapid, though in one or two places it flows quietly. At Kinthup's falls the rapid develops into a fall of about 30 feet; here rainbows were seen. We succeeded in pushing about 12 miles below Pemako Chung. Our lowest hypsometer observation, taken about 2 miles above the lowest point mapped, gave an altitude of 7200. The gap in the river which is unmapped we estimate at 45 miles, *i.e.* from the lowest point reached below Pemako Chung to Lagong. The gap between the two boiling point observations (below Pemako Chung, and at the confluence of the Chimdro Chu and the Tsang-po) is, however, about 90 miles. In the 45 miles that are unmapped we have the estimated height of 6000 feet of the Po Chu-Tsang-po confluence at Gompo Ne, which cannot be much in excess. The road down from Gompo Ne to Lagong is used a great deal in winter, as when the Su La is closed by snow, it is the only road from the Po Chu valley to the lower Tsang-po valley. We met a great many people who had seen this part of the river, all of whom agreed that there was nothing in the way of falls on it, though at the confluence of the rivers at Gompo Ne there are remarkable rapids and whirlpools. As regards the portion between Pemako Chung and Gompo Ne it was more difficult to collect information, as there is no road, but the distance can only be about 15 miles, and we met people who had hunted in the jungles in the neighbourhood who all said that there was no big waterfall on that section of the river, though the rapids must be extraordinarily steep.

The heights mentioned are liable to revision.

THE RIVERS OF FRANCE AND THE SUPPLY OF WATER POWER.*

By a decree of March 25, 1903, the French Ministry of Agriculture constituted a *Service d'Etudes des Grandes Forces Hydrauliques*, the purpose of which was to examine the resources of the country in respect of supply of water and water power from rivers, and to inquire into the best methods to be adopted for their development. Two regions were attacked at once—that of the Alps south and east of the Rhone, and that of the south-west draining by the Garonne, Adour, and other rivers from the Pyrenees. In the first the work was placed in charge of MM. R. Tavernier and R. de la Brosse, Ingénieurs en Chef des Ponts et Chaussées. The south-western district was organized at first on a smaller scale with the existing staff of the *Service Hydraulique*, but in 1909 it was brought into line with the Alpine district and put under the control of M. Tavernier.

The programme originally drawn up set forth two main divisions of work: (1) the purely physical study, from the geographical, meteorological, and

* 'Ministère de l'Agriculture. Direction de l'hydraulique, etc.' [*in later issues*, Direction-générale des Eaux et Forêts]. Service (d'études) des grands forces hydrauliques (dans la) région des Alpes. Tomes 1–6, and Annexe du Tome 6. The same. Région du Sud-Ouest. Tomes 1–2. Paris, 1905–1913. *Maps and Illustrations.*

hydrographical points of view, of the courses and catchment areas of the rivers; and (2) a study of the economics of questions arising in connection with supplies of water or of water-power. This programme has been closely adhered to, and the reports of work done already published occupy six substantial volumes for the Alpine district and two for the Pyrenean district, together with a number of "pochettes" containing maps and sections. The physical work itself falls again into two main divisions, one which concerns what may be regarded as constant quantities, and another dealing with quantities varying periodically or irregularly about mean values. In the first case measurements may be made once for all, except for occasional corrections; this includes estimates of areas drained and levellings to ascertain the slopes of river-beds. The second requires observation continued over a period of years; under this head there fall chiefly determinations of mean rainfall and the volume and velocity of currents.

The region of the Alps has now been fairly adequately surveyed. Areas have been measured with the Coradi planimeter on the general maps of scale 1 : 50,000, and the results are published in detailed tables, giving areas between defined altitudes. The methods of levelling, either by staff and level or by a special instrument employed on steep gradients, are minutely described in a paper by M. Lallemand, director of the *Service du Nivellement Général*, which is itself a valuable contribution to the subject (vol. 4, p. 33). Part of the results is given in an elaborate series of general and special sections or profiles, 77 in number, the former having scales of 1 : 100,000 and 1 : 10,000 for distances and heights respectively, and the latter corresponding scales of 1 : 50,000 and 1 : 5000; these represent 1493 kilometres out of 2931 surveyed to December 31, 1913.

The gauging of streams of such diverse *régime* as those found in this Alpine region is naturally a matter of much difficulty, and no one method is applicable throughout. The instrument used is for the most part that of Ott, of Kempten, Bavaria, modified or supplemented in special cases by Richard recording apparatus. A calibrating laboratory has been established at Grenoble. Many of the special devices for gauging in difficult places are of great interest; full details are given, illustrated in many cases by excellent photographs.

The expression of the results of these gaugings is a matter of the first importance and of considerable difficulty, in view of the purposes which they, or investigations based upon them, are intended to serve. The subject is discussed in several papers in different parts of the reports, but most fully by M. de la Brosse in the introductory chapter of vol. 6. M. de la Brosse concludes that the characteristic element of a quickly flowing stream is the total quantity of energy which it can supply in an average year. Taking the volume of water V in litres and the height of fall H in metres, he expresses the potential P, in kilowatt-hours, by the formula—

$$P = \frac{H \times V}{367{,}000}$$

The maximum deviations, positive and negative, from the mean value P are of course of great importance, as well as the normal differences at any season of the year. M. de la Brosse gives, as an example, the figures for the Haut-Rhone between the Franco-Swiss frontier and Génissiat, and shows the value of his method in studying the conditions of natural flow and their relation to engineering works intended to produce either a steady flow of water (*régime régularisé*), or a flow placed under such control (by means of reservoirs or otherwise) that water or power can be furnished as required (*régime perfectionée*).

The magnitude of the interests already involved, and the growth probable in the near future, are discussed by M. de la Brosse in chapter II. of vol. 4.

We learn that at the end of 1910 motors representing 475,000 horse-power were installed in this region of the French Alps, and that projects in hand or under consideration may raise this total before long to somewhere near 1,500,000 h.-p.

In the south-western district the systematic survey on modern lines is naturally not so far advanced, since its inauguration on an adequate scale is more recent. An additional interest is, however, introduced by the fact that, chiefly because of the area exposed to danger from inundations, observations of one sort or another with a view chiefly to flood prediction have been made for a long time, and it is possible to utilize a good deal of the older data. M. Tavernier summarizes the historical papers of Angot with regard to the meteorological observations, and gives an account of hydrographical material collected after 1856, in consequence of a letter by the Emperor Napoleon III., urging the need of taking steps to prevent recurrence of the disasters of that period. Except that the work of levelling and preparing profiles is deferred, the general methods now adopted are the same as in the Alpine region, and the reports published (bringing the work up to December 31, 1910) give the areas of the basins under examination, and a large number of gaugings. Short notes and papers of a technical character are included in the body of the reports; amongst them one comparing the general *régime* of the Pyrenean district with that of the Alps and contrasting the relative importance of the regulating action of glaciers and lakes in the two cases. This last question raises many points of extreme interest to the student of physical geography, but the full discussion of the problems suggested, and indeed of the whole subject viewed in its more scientific aspects, must await the accumulation of rainfall data by the improved network of stations which is being organized.

In a concluding summary of the report on the south-western district, M. Tavernier points out how the epoch-making discovery of a means of transmitting energy in the form of electricity has brought the examination of water resources into new prominence. The old problems of water supply and of protection from damage by flood were, and are, important in certain districts. But the demand for cheap electrical energy, "a, dans tous les pays civilisés, suscité la création de vastes enquêtes et de puissants services d'Etats chargés d'étudier, au point de vue le plus général, le régime des eaux courantes." M. Tavernier instances the United States, Italy, Switzerland, Bavaria, and Austria. We note one interesting omission from the list of "pays civilisés." When our day comes we may at least have the satisfaction of knowing that, thanks to private enterprise, the organization of rainfall stations will not be found wanting.

H. N. D.

REVIEWS.

EUROPE.

The Eastern Pyrenees.

'Les Pyrénées Méditerranéennes: Etude de Géographie biologique.' By Maximilien Sorre. Paris: Colin. 1913. *Map and Illustrations.* 12 *fr.*

By "Mediterranean Pyrenees" the author (whose previous contributions to the human geography of the Mediterranean region have from time to time been noticed in the *Journal*) understands the eastern extremity of the Pyrenees, beginning with Andorra, together with the sum-total of the lower mountains, hills, and plains which form their pendant to the north and south. It is a complex of small regions arranged symmetrically on both sides of the frontier, each possessing a distinct individuality, and designated by names which have been in use since the remoter Middle Ages ("Roussillon," "Capcir," and the like). The

northern limit of the area studied corresponds with a linguistic frontier, that of the Catalan tongue; the southern is a climatic and vegetational limit, marking off a humid region characterized by the high development of foliage trees.

The larger part of the work is devoted to "modes of life." M. Sorre shows how the forms of life vary according to the proportion in which they combine the influences of the two worlds here in contact—the Mediterranean and the Mountain. Mediterranean modes of life are met with in the plain and in the lower hills (represented in the former by the irrigation system of Roussillon, the *vegas* of the Seu d'Urgel, and in the latter by the sub-Pyrenean agricultural valleys and the cork-oak region of the Gavarra hills). The Mountain has evolved a mode of life of its own by varying combinations of agriculture and pastoral industry in accordance with varieties of relief. The book includes some interesting details on the secluded state of Andorra. I. ASSADA.

ASIA.

THE HEART OF ASIA.

'Unknown Mongolia: a record of travel and exploration in North-West Mongolia and Dzungaria.' By Douglas Carruthers. 2 vols. London: Hutchinson & Co. 1913. *Maps and Illustrations. Price* 28*s. net.*

In the present day an increasingly high standard is expected of explorers both in their work and in the books they write describing their work. They must have a good training for exploration, and be able to present their results in a readable form for the public. Mr. Carruthers has fully come up to this standard. In view of the fact that the detailed scientific results will be published separately, his book might possibly have been more acceptable to the general public if it had been more condensed, for people nowadays have so many books even of travel alone to read. But we can well understand that when a traveller has worked as hard as Mr. Carruthers did to get his information he does not like to leave a single item unmentioned.

It is certainly remarkable that a portion of Asia, presenting so much of interest politically, historically, and geographically, should have been so little explored, even by Russians, so that in the basin of the upper Yenisei, in north-west Mongolia, and in parts of Dzungaria, Mr. Carruthers found a virgin field for exploration. And the country proved to be not barren and worthless as so much else of Mongolia, but in many parts covered with forests, interspersed with lakes, and watered by great rivers; and in other parts furnishing rich grazing lands which might in future become one of the best cattle-rearing regions in the world. It proves, in fact, to be a land of great possibilities. And this is, perhaps, not altogether to be wondered at, considering that from here sprung the Mongols who gave a dynasty to China, founded an empire in India, and overran half Europe; the Turks who now rule at Constantinople and once ruled nearly up to Vienna; the Finns of Russia, and the Magyars of Hungary. And with Russia moving and China awakening, this part of Mongolia, so long now dormant, will certainly come into life again.

The labours of Mr. Carruthers and his companions, Mr. Price and Mr. Miller, were certainly well timed. They were also very thorough. Mr. Carruthers describes the zest with which he carried on his survey work, and the difficulties he had to overcome. In the upper Yenisei basin it was often hard to find whether a stream flowed to China or to Siberia. And he had to search diligently among a maze of bogs and lakelets for a water-parting. Often important peaks were hidden in mist. And the vastness of the unexplored area to be mapped was both oppressing and stimulating to the explorer.

In addition to purely geographical work, Mr. Carruthers' party had much else to occupy their energies. Mr. Miller studied the natural history, and has contributed three chapters of valuable information upon the fauna of those unfrequented parts. Mr. Price studied the botany and geology. And Mr. Carruthers himself also collected natural history specimens, and, most important of all, made a remarkably intimate study of the inhabitants.

The question this Society would naturally be most interested in is, whether there is anything in the geography of this region to account for the double phenomenon of great waves of conquering hosts rolling outward hence in ancient times and for the steady decadence of the present-day inhabitants.

On these points Mr. Carruthers will have more to say before the Research Department of the Society. But his book makes it quite clear that the part of Mongolia from which the successive waves of invaders burst forth upon Asia and Europe is good pasture land to-day, and must have been still better when those irruptions took place. The photographs and descriptions suggest that the open expanses and the vigorous climate may have fostered in the inhabitants an adventurous spirit, as the scenery of Greece fostered in the Greeks a sense of the beautiful. This may have been so, and the absence of any political boundaries and the pastoral habits of the people accustomed to wander about from pasture land to pasture land according as each was most favourable may have started the Mongols on the move. At any rate, if geography did not cause, neither did it place obstacles in the way of, migration. There were no great mountain barriers, such as enclose India, to shut in the Mongols. The mountain ridges are crossed without difficulty in the summer months.

But why should the Mongols, who were once so virile and aggressive, be to-day in the selfsame region so tame and decadent? Mr. Carruthers says there is some reason to think that the climate may be slightly dryer, but this is not sufficient to account for the change. And he makes a number of observations throughout the book all tending to show the important part which religion has played in bringing about the result. Nothing is more remarkable than the difference which he observed between peoples of the same original stock and living under the same physical conditions, but of whom the one had adopted Buddhism and the other Mohammedanism. When Mr. Carruthers remarked this particularly, and when his observations are most noteworthy, was when passing in a single day's march from the Buddhist Mongols to the Mohammedan Kirghis tribe of Kirei. The Buddhist Mongols—the very descendants, perhaps, of Jenghiz Khan's men—were dirty, lazy, and apathetic. The Mohammedan Kirei were clean, polite, and vigorous. And Mr. Carruthers attributes the difference, rightly in our opinion, to the debilitating effects of the Lamaistic form of Buddhism which the Mongols have adopted, and to the invigorating effects of Mohammedanism which the Kirei have embraced. These Kirei, indeed, seem to be a remarkably interesting people. They are said to be one of the purest branches of the Turks, and to be the truest example of the original Turks, but different from the Uigurs, with whose history their own is so much mixed up. They were also at one time Christian—Nestorian Christian—and the subjects of the fabulous Prester John, an isolated Christian tribe in the midst of pagan Asia. They were conquered by Jenghiz Khan and subsequently became Mohammedan, and, hence, according to Mr. Carruthers, their advancement in comparison with the Mongol tribes who became Buddhist.

Mr. Carruthers is evidently very much in sympathy with Mohammedanism, and his account of the way it is spreading in the eastern part of Asia, and of the good it is effecting, is worthy of the closest attention. His book is, indeed, a

highly valuable contribution to much more than Central Asian geography. And the work of Mr. Miller, the numerous and clear illustrations, and the specially executed map, add much to its value. F. E. Y.

AFRICA.

Rhodesia.

'Les Lois et L'Administration de la Rhodésie.' Par Henri Rolin, Judge au Tribunal de première instance, Professeur à l'Université de Bruxelles, etc. Brussels: Émile Bruylant; Paris: A. Challamel. 1913. *Maps and Diagrams.* 12 *frs.*

Prof. Rolin has in this study of Rhodesia written a notable book. It will be for years the standard authority upon the subject. We know of no work in English at all comparable to it. The title of the volume scarcely reveals the full scope of the author's inquiry. He has not aimed simply at stating the laws in vogue in Rhodesia and describing the system of administration; he has sought also to show how the laws, and the administration, respond to abstract justice, what relation they have to history and to the social and economic conditions of Rhodesia. The British South Africa Company should be pleased, on the whole, with this verdict of an impartial inquirer on their record. There are three main sections of the book: (1) the political and judicial organization of Rhodesia; (2) the policy of the whites—officials and non-officials—towards the natives; (3) the material and moral position of the colonists. It will be seen that in a large measure Mons. Rolin deals with matters outside the scope of this journal. The whole treatise is, however, fitted into a geographical framework, and throughout the reader is made aware of the influence of the land on its peoples.

To a profound study of the written laws and a minute and patient investigation of the literature concerning Rhodesia Mons. Rolin adds personal acquaintance with the country, and in his opening pages we get a vivid impressionist sketch of the main topographical features of Africa—from Table Bay to Katanga. Then, after a short historical chapter (in which a sympathetic study is given of Cecil Rhodes), Mons. Rolin plunges into the consideration of a series of most perplexing problems, handling them with such lucidity and in so facile a manner that the grip of the book rarely relaxes. As he observes, the experiences of Rhodesia should be of much value to the Belgians in Katanga, the only part of their Congo colony where there is a likelihood of a considerable white population. One complaint may be made. The first chapter, as we have said, is topographical, and the first footnote reads as follows, 'Le superficie de la Rhodésie, en kilomètres carrés, est indiquée plus loin (II^e^ partie, chap. 1).'' It would have been just as simple, and have avoided irritation, to have given the area of Rhodesia in the footnote, with an added reference to Part II. if desired. There are other footnotes of the same character; these and one or two small slips, such as "J. Cecil Rhodes" in one place, by no means impair the accuracy of the book as a whole.

Mons. Rolin's chief concern, as it must be that of all serious students of South African affairs, is the future relation of the white and black races to each other. Rhodesian policy leans towards the separation of the races. Some of the maps show the extent and position of existing native reserves. Of these the largest is the Barotse country, which is something more than an ordinary reserve, as there Lewanika still exercises sovereignty. Other maps show the gold-bearing regions and the alienated lands in Southern Rhodesia; still another map shows the districts into which Southern Rhodesia is divided.

There is a very full bibliography, while in footnotes to the text the exact reference to the authority cited is given. The table of contents is also very full, and the index is of some use. F. R. C.

The Basuto.

'History of the Basuto, ancient and modern.' Compiled by D. Fred. Ellenberger, V.D.M., and written in English by J. C. Macgregor, Assistant Commissioner, under the auspices of the Basutoland Government. London: Caxton Publishing Company, Ltd. 1912. *7s. 6d. net.*

The story of the Basuto was attractively told some time ago by Sir Godfrey Lagden ('The Basutos.' 2 vols. Hutchinson & Co., 1909), but it cannot be said that his work conflicts with the volume now before us. Sir Godfrey Lagden wrote of the Basuto of to-day, the pre-Moshesh period being very briefly considered. Mr. Ellenberger (a well-known missionary of the Paris Evangelical Society) goes back to remote origins, and he ends, as far as the present work is concerned, with 1833 and the arrival of the first missionaries. "The unravelling of the history of the Basuto, out of the tangled tradition which surrounds it, is a task which inspires a lively fear that it will never be completed," wrote Mr. Ellenberger. The difficulty of the task will be readily conceded by any one who examines this volume. An attempt is made to trace the movements and genealogy of all the tribes of Basuto blood, or who were ancestors of the Basuto, and lived or live between the Orange river on the south, the Drakensberg on the east, and the Vaal and Limpopo on the west and north. At first we are taken to the older Bechuana tribes for whom an Egyptian or Ethiopian origin is claimed. But the first immigrant Bantu into the country now called Basutoland were the Maphetla (*i.e.* Pioneers), who trekked from the banks of the Tugela *circa* 1600. Thence onward we seem on firmer ground, but an understanding of the author's argument would be infinitely easier had he provided diagrammatic maps showing what he believes to be the track of the migrating tribes and clans, and also summarized his conclusions in an elucidatory chapter. We cannot but feel that the author, for the first period of Basuto history, might have helped us more than he has done. For the second period, that of the troubles caused by the uprise of the Zulu power, we are thankful to have a good introductory explanation.

Some most valuable chapters are placed in appendices, notably the account of the religious and social life of the ancient Basuto, and the history of Sebetoane (Sebituane), the conqueror of the Marotse.

Mr. Ellenberger's manuscript, written in French, has been Englished by Mr. Macgregor, the assistant commissioner at Leribe, who has added occasional illuminating footnotes. In a brief foreword Sir H. C. Sloley states that the period covered by the author's manuscript extends to 1853. Doubtless in another volume we shall get the events of 1833–1853, showing us Moshesh at the height of his power.

F. R. C.

AMERICA.

North American Earthquakes.

(i.) 'The Earthquakes at Yakutat Bay, Alaska, in September, 1899.' By R. S. Tarr and L. Martin. U.S. Geol. Surv., Professional Paper 69. Pp. 135. (ii.) 'The New Madrid Earthquake.' By M. L. Fuller, U.S. Geol. Survt, Bull. No. 494. Pp. 119.

Recent publications of the United States Geological Survey include two valuable reports: one on the Alaskan earthquakes of 1899, the other on the New Madrid earthquakes of 1811–12.

(i.) The Alaskan earthquakes of 1899 were chiefly remarkable for the extraordinary uplifts which occurred with the second earthquake of September 10,

1899, and for the effects of the earthquakes on the glaciers in the neighbourhood of Yakutat bay. Both phenomena have been described in numerous papers and preliminary notices, and the present volume embodies the final conclusions of the authors. Of the uplifts, which in one part of the coast reached the unprecedented amount of 47 feet 4 inches, it is unnecessary to give any account here, a full description having already been published in the *Geographical Journal* (vol. **28**, 1906, pp. 30–43).

The effects of the earthquakes on the glaciers of Yakutat bay were not manifest until 1906. In the previous year all the glaciers, with one exception, were receding, and their surfaces were smooth and easily crossed. Ten months later the appearance of the smaller glaciers (from 6 to 10 miles long) was entirely changed. They had advanced several hundred yards and increased greatly in thickness, and their surfaces were converted into a wilderness of pinnacles and crevasses, which it was impossible to cross. In 1909, these glaciers had ceased to advance, and the crevasses were partially healed, but some of the larger glaciers (from 16 to 20 miles long), that were unaffected in 1906, had begun to advance. In all the glaciers the phenomena were the same—a spasmodic advance of several hundred yards (in one case of 2 miles), occupying ten months or less, after which the glaciers returned rapidly to a state of stagnation. As to the cause of the advance there can be little doubt. From the slopes of the St. Elias and Fairweather ranges, which lie a few miles to the north of Yakutat bay, innumerable avalanches of snow and ice must have fallen on the glacier reservoirs. The thrust transmitted from the overloaded reservoirs would result in the more rapid flow of the plastic basal ice and the shattering of the rigid surface ice.

(ii.) The New Madrid earthquakes of 1811–12 are known to English readers chiefly through Lyell's observations made thirty-five years afterwards. Many effects of the earthquakes on the alluvial plains of the Mississippi, though they have lost their freshness, are still well preserved, and Mr. Fuller has done good service by his recent careful studies of their remains. The principal phenomena are those which relate to the extrusion of sand from fissures and vents, and the changes of level in the form of domes and sunk-lands.

Sand-craters are formed in all great earthquakes through the violent ejection of water and sand from earth-fissures. Mr. Fuller describes other forms, such as sand-blows and sand-sloughs, which result from the quiet extrusion of sand, the former being low mounds, usually circular in shape and of various diameters up to 100 feet or more. Sand-sloughs are low ridges of sand alternating with shallow troughs in which water is collected in long narrow pools. Both sand-blows and sand-sloughs are probably caused by the unequal settling of the alluvial deposits into the water-bearing stratum below.

The warping of the surface, in the form of domes and sunk-lands, is of still greater interest. Mr. Fuller describes three principal domes or uplifts, of which the largest is about 15 miles in length, with a maximum elevation of about 20 feet, all three taken together forming a long and narrow ridge. To the east of this ridge lies a trough occupied by the Mississippi and Reelfoot lake; to the west another trough occupied by Little river, Big lake, and Lake Nicormy; and still farther to the west a second ridge and a third trough occupied with other sunk-lands. Thus there seems to be at least three parallel troughs with intervening ridges. Mr. Fuller attributes the earthquakes to movements along a fault lying a few miles west of the Mississippi and in a direction about N. 30° E., which is approximately that of the troughs and ridges.

The causes of the warping is not quite clear. Mr. Fuller considers that it

cannot be the surface representation of corrugations in the underlying rocks, or due to undermining by the extrusion of sand through fissures, or by its lateral flow towards the river, or produced by lateral thrust from the hard-rock borders of the basin. The explanation that he prefers is a further subsidence of the basin, and this he considers would account for the position of the domes and their absence from other areas on the east and west, and for the general preponderance of subsidence over uplift.

C. D.

Early Trans-Atlantic Voyages.

'Early Norse Visits to North America.' By William H. Babcock. (Smithsonian Miscellaneous Collections, vol. 59, No. 17.) Washington: 1913.

Mr. Babcock has contributed to the Smithsonian Miscellaneous Collections a detailed discussion of the early Norse visits to North America, preceded by notices of the treatment of the imaginary Atlantic islands in old maps, and of the Zeni map.

There is a fascination about the study of those mysterious isles, of their origin and possible localities, which has occupied several learned predecessors of Mr. Babcock, yet he has thrown some light on very difficult questions. His adoption of the explanation that Antilia is a corruption of Ante-ilha, the outermost island, leads him to identify it with Corvo, the most western of the Azores, until the map-makers began to give it an independent existence still further west. Mr. Babcock is no doubt right in giving the name Brazil an Irish origin. The island of Brazil has been moved about a good deal by successive map-makers, but more than one authority gives it a fixed locality in Terceira, one of the Azores. It is almost always associated with its product of dye wood.

The Isle of St. Brandan has been still more difficult to place. Perhaps the remarkable passage, quoted by Espinosa,* to the effect that "Blandanus magnæ absistentiæ vir ex Scotia" (Ireland?) landed at Tenerife, may throw light on the question. Mr. Babcock refers to the passage without giving an opinion.

Mr. Babcock properly rejects the supposed evidence of the Dighton rock pictures and other imaginary relics; and he dismisses the misleading Zeni maps by saying that "this Italian literary curiosity of the Zeni is not such a thread of evidence as will bear any serious strain."[1] Nor can our author accept the late Prof. Horsford's theory about the Norse colony on the Charles river. With all his erudition and learning, Prof. Horsford was too imaginative and too positive.

The larger portion of Mr. Babcock's essay is devoted to the Norse voyages to America. He gives the history of the authorities in detail, defending Adam of Bremen, and discriminating between the Sagas. He also gives a sufficient number of extracts from them to enable his readers to acquire a knowledge of the subject. But this does not appear to be his primary motive, which is to refute Dr. Nansen's view that the story of the vines and sown cornfields in Wineland were derived, directly or indirectly, from the account which St. Isidore gave of the Fortunate islands. Mr. Babcock investigated the question of vines, and found that grapes did not ripen north of Massachusetts. It was, therefore, necessary to take Thorfinn Karlsefni as far south as Cape Cod. It was also, of course, indispensable that the natives met with by

* See 'The Guanches of Tenerife,' translated by Sir Clements Markham from the work of Friar Alonso de Espinosa (Hakluyt Society, 1907), p. 29.

Thorfinn should be Indian and not Eskimo. There are fairly good arguments, so far as they go, on both sides. Mr. Babcock, however, does not seem to be acquainted with Mr. Thalbitzer's recent pamphlet, showing that the names given by Thorfinn's young captives are of Eskimo derivation. There are some statements in the Sagas from which the latitude may be roughly inferred, but on these Mr. Babcock does not dwell.

Our author argues closely, he is far from being rash in his conclusions, and his essay is certainly an addition of some value to the literature of the subject. He justly expresses admiration for the Norse voyagers, especially for Gudrid, the first white American mother. His conclusion is that Labrador was *Helluland*, Newfoundland *Markland*, Avalon peninsula *Biarney*, Nova Scotia *Wonder-strand*, Passamaquody bay *Straumey* and *Straumfjord*, Cape Cod *Hop*, and New England *Wineland*. C. R. M.

POLAR REGIONS.

The Greenland Sea.

'Danmark-Ekspeditionen til Grønlands Nordøstkyst, 1906-1908.' Bd. I., No. 2. Hydrographical Observations. By Alf Trolle. Reprinted from *Meddelelser om Grønland*, xli. Copenhagen: Bianco Luno. 1913.

Over 150 pages, with numerous maps and sections, contain the valuable observations on depths, temperatures, salinities, tides, etc., of Mylius-Erichsen's expedition. A great deal of work had previously been done in the Greenland sea, which the *Danmark's* work amplifies and confirms, but hitherto no winter observations had been taken in the north-eastern part north of Scoresby sound. Furthermore, the Danes carried out detailed investigations in the fjords of north-east Greenland at different seasons of the year.

The soundings are plotted on a chart showing the greater part of the Greenland sea in the light of all known data. They define more clearly the edge of the continental bank in about 76° N. East of Koldewey island, in 76° N., 17° W., a bank with only 41½ fathoms was found, separated from the coast by 164 fathoms. This seems comparable to the Belgica bank further north. The Great and Little belts and Öre sound, the entrances to Dove bay, show sills at their entrances, in the Great belt as deep as 164 fathoms. The inlets further south were not sounded, but stranded icebergs indicated bars.

The hydrographical results tally closely with those discussed by Helland-Hansen from the work of the Duke of Orleans in 1905. The true polar current flows south over the continental shelf of Greenland, and to the eastward is quickly lost. The warm surface layer east of the shelf is not found over the shelf itself, where the only heated patches are quite local and of no great depths. Here we get an explanation of the continuous masses of pack-ice near the coast which impede access to the land. Behind this ice an ice-free stretch of coastal water has been found several times—due, according to Lieut. Trolle, to an eastward-flowing movement of the surface waters off the coast in summer which prevents the polar current from quite reaching the land. This belt of coastal waters with irregular currents (chiefly southward) requires further explanation. An investigation of the saline waters of the inland lake of Saelso in Germania Land showed them to have the composition of sea-water.

Drift bottles gave important current determinations. In the main part of the Greenland sea the current seems to circle round from near Greenland first to the north, then east past Iceland, north of the Færoes, and north-east up the coast of Norway. The westerly part of the polar current, however, seems to

round Cape Farewell and then set northward again. Bottles thrown in to the east of the polar current reached the Shetlands and Hebrides in three and two and a half years respectively.

Without wishing to appear too critical, we should like to call attention to the misuse of the term "Gulf stream" on p. 275 in relation to the Atlantic drift off the shores of Spitsbergen.

R. N. R. B.

GENERAL.

Jewish Emigration from Europe to the United States.

'Le Juif Errant d'aujourdhui.' By L. Hersch. Paris: M. Giard & E. Brière, 12 rue Toullier. 1913. Pp. 331. *Diagrams.* 6 *fr.*

M. Hersch has produced an important study of the emigration of the Jews from Europe to the United States during the period 1899–1910. He demonstrates that the facts are as follows: during the period, over a million Jews have gone to the United States from Russia, Austria-Hungary, and Rumania, forming one-ninth of the total number of immigrants: except for the South Italians, no other race than the Jews has contributed so largely to this total; these Jews have left the "zone of residence" in a much larger proportion than the other inhabitants of this zone; Jews form 44 per cent. of the total number of emigrants from Russia and 8 per cent. of those from the Dual Monarchy; except the Irish, no race sends so few of the emigrants back to Europe—the Jewish migration is permanent; 57 per cent. of the migrants are males—no race but the Irish has so few men proportionately; there is a relatively high proportion of children under fourteen and persons over forty-five among the Jews; the migration is largely a movement of families rather than individuals; no other race sends so many dependents; no other race sends relatively so many skilled workers and so few people interested in the land; nearly half of the skilled workers are workers in clothes—the Jewish tailor immigrants are twice as numerous as those from all other countries.

The Jewish migration has, therefore, an exceptional character both on account of the numbers of the people and of the classes of the people who are leaving the Jewish districts of Central Europe. At the same time, two other facts stand out prominently—first, the migrants flock to the towns and not to the farms; and, secondly, the numbers who have left Europe are slightly lower in total than the natural increase in the Jewish population of the lands they have left, so that the congestion of population in Central Europe is no less than it was before 1899. In fact, the migration overseas has been accompanied by a migration in Europe, both from the country villages to the towns, and from one part of the zone of residence to another.

The causes of the emigration are, no doubt, partly political, but they are also in part economic, and are due to the revolution which has occurred in Russia later than in Western Europe, whereby domestic manufactures have given place to factory work on a capitalistic scale.

The Jew is a man of affairs, and, in consequence of the trade depression which has succeeded this revolution, he has found that the people among whom he lived have less surplus money to spend than they used to have; and, since they have lost the small plots of land which they used to cultivate, they have no supplies of food materials to sell to the Jew for the latter to sell again. One hope the author sees for the Jew in Europe: that he will enter into manufacturing on a large scale for distant markets. An interesting commentary upon the relative purchasing power of money in different countries arises in connection

with the fact that most of the emigrants better their position and are able to send home supplies of money which are eagerly awaited at the local post office on the day of the arrival of the American mail.

The complete record of the migration is notable geographically for its evidence of the persistence of racial characteristics under varying conditions.

B. C. W.

Educational Books.

'The Oxford Geographies.' (1) 'Animal Geography.' By M. I. Newbigin. (Pp. 238. *Illustrations. No Maps.* 4*s.* 6*d.*) (2) 'A Commercial Geography of the World.' By O. J. R. Howarth. (Pp. 236. *Maps and Diagrams.* 2*s.* 6*d.*) (3) 'An Elementary Geography of Scotland.' By M. I. Newbigin. (Pp. 135. *Maps and Illustrations.* 1*s.* 6*d.*) Oxford: The Clarendon Press. 1913.

Miss Newbigin (1) introduces her subject by a brief discussion of the natural regions of the world, proceeds to describe the fauna of these regions, completes the description with a treatment of animal life in the sea and in lakes and rivers, and concludes with a chapter on zoogeographical regions. This final chapter introduces the hypothesis that "the specialized forms in each separate region have been evolved from pre-existing unspecialized forms inhabiting the region"; and the world is divided into six regions, for each of which the typical animals are specified. A notable feature of the book is the bibliography appended to each chapter, and readers who are not familiar with the scientific nomenclature will find the outline classification in the appendix useful.

Mr. Howarth (2) introduces the reader to the influence of climate and relief on commerce and industry; and then makes use of three sets of divisions of the world. The basis of the first set of divisions is temperature, and the typical products of the cold, temperate, and hot lands are described. The second basis depends upon the occupations of the people. Fishing, mining, and manufactures, transport, and trade with a separate chapter on the grain trade and kindred subjects, are heads of chapters. The third classification is by country or group of countries: the British Isles, North America, the monsoonal and other Asiatic territories, are specimens of the areas considered separately. The maps and diagrams are exceptionally clear, and illustrate with marked precision the particular point for which they have been constructed.

The excellence of the maps, etc., is also a marked feature of Miss Newbigin's 'Introduction to the geography of Scotland and, for Scottish children, general introduction to geography.' To introduce a knowledge of maps, Miss Newbigin describes the position of Edinburgh; to introduce the human element in geography, she discusses the occupations of the people of Edinburgh and Glasgow; and then she passes to the discussion of the natural regions of Scotland, and emphasizes the physical features by special reference to the railways. A treatment of climate and its results in the products of the country and the occupations of the people as a whole then follows, and the work is crowned by chapters on the counties of Scotland and the position of the country. To each chapter is appended a summary as well as exercises.

'A Geography of the British Empire.' By W. L. Bunting and H. L. Collen. Cambridge University Press. Crown 4to. Pp. viii., 160. *Maps, Diagrams, and Illustrations.* 3*s.* 6*d.*

'The Atlas Geographies.' By T. Franklin and E. D. Griffiths. *Maps, Diagrams, and Illustrations.* London: W. & A. K. Johnston, Ltd. 'For Higher Elementary and Lower Forms of Secondary Schools. Book I. Physical Geography.' Pp. viii., 88. 1*s.* 6*d. net.* 'Book II. Junior Geography.' Pp. viii. 184.

'For Elementary Schools. I. Preparatory: British Isles.' Pp. 33. 6*d. net.*
'Preparatory: Europe.' Pp. 30. 6*d. net.*
'Deductive Exercises in Geography. Europe.' By C. R. Dudley. Pp. 62. *Full-page Maps.* London: George Philip & Son, Ltd. 1*s.*

The first two of these books are intended roughly for the same pupils, and the authors are in opposition as to method: Messrs. Bunting and Collen demand individual work from the reader and the use of an atlas, Messrs. Franklin & Griffiths introduce not only this book but the series to which it belongs by the statement that they have been induced to compile the series owing to the difficulty they have experienced in practical teaching because the atlas is divorced from the text-book. Consequently, the first book aims at supplementing the atlas with other illustrations, and the second book contains everything which the pupil may be called upon to use. The first book is probably the more attractive, for this reason and also because the text is less scrappy and more coherent. The authors provide an introduction dealing with general principles, and then an account of the parts of the Empire. The second book, Part I., deals with all those matters which used to be summarized under the term "physiography," and includes some elementary surveying, climatology, geology, etc.

The Junior Geography, by Messrs. Franklin and Griffiths, contains seven chapters, one each for the British Isles, Europe (excluding British Isles), North America and South America, and for the remaining three continents. Each chapter follows the same plan—position, surface, routes, climate, organic products, minerals and manufactures, population, political divisions. The 6*d.* books are merely reprints of the corresponding chapters of the Junior Geography. Map-reading for topographical features is a distinct feature of the treatment; a typical exercise is the following: "Name three of the most rapid streams in England and Wales, and three of the slowest. Give reasons for your answer." The climatic treatment is based on maps showing isotherms and isohyets for January and July. Referring to the British Isles: "The isotherms run from east to west in summer because the west wind now blows all over the island, the east wind only being felt in winter. Therefore the east is as warm, if not warmer, than the west." The vegetation maps fail to indicate the great oats culture of north-east Ireland and the position of the area of great wheat culture in Western Europe. It may be suggested that the population map of Asia should suggest the dense population of the great plains of the lower portions of the Ganges and Yang-tse valleys. A feature of these books is the incorporation of the coloured orographical maps which Messrs. Johnston sell at a penny each, and the provision of loose copies of these maps in a pocket at the end of the book. The route maps are all printed on transparent paper, so that an orographical map may be seen when placed underneath the route map.

The third book, by Mr. Dudley, goes a stage further than either of the others, for while the latter both contain a large amount of text and a few exercises, this book consists entirely of questions and maps. Mr. Dudley uses the title Deductive Exercises in Geography: where his exercises are observational, they are good, but where they are deductive they appear to be beyond the power of school pupils. Before children can make deductions usefully, they must have made or learnt the precedent inductions. For example, the pupil is expected to trace probable railway routes on a map of Europe showing by layers four elevations of the land and no towns; he is asked to compare the commercial values of the Volga and the Rhine, the Danube, and the Elbe; to suggest reasons, based on a drainage map of Europe, for the ancient importance of the

Mediterranean; to explain, in relation to maps of winter and summer rainfall, why the Mediterranean has summer drought.

In the book on the British Empire there are some matters to which attention should be given in reference to a later edition: a map is not a picture; the important fact about the Pennine upland between the dense populations of Lancashire and Yorkshire is the comparative failure of the upland to keep the peoples apart; in New Zealand the chief sheep-district is near Wellington, and the population of New Zealand is related more closely to the sheep districts than to the relief of the land; and, finally, it is unfortunate that the statistics given regarding wheat production in Canada should be those for single years and therefore tend to convey an erroneous impression. In the Physical Geography also certain statements require revision: for example, in one place it is stated that whenever there is cloud in the sky it is raining, and in another place it is admitted that many of the clouds of the upper air contain snow crystals; the arrangement of the contrast between tidal motion and wind motion of oceanic waters suggests that the tidal wave affects the deep waters of the ocean down to the lowest depths; and we read "the lee sides of mountains having a warm dry climate are said to be in the rain shadow."[1] Figs. 34 and 37 fail in exactly opposite ways, the one suggests solidity and is a section, the other fails to suggest depth.

'Asia: A Geography Reader.' By Ellsworth Huntington. (New York: Rand, McNally & Co. Pp. xxvi., 344. *Maps and Illustrations.*) This book is the first of a series of supplementary geographical volumes written by a geographer of high repute, who is an authority on the area described, and intended to add good strong side lights to the necessarily brief and somewhat formal presentation of the more comprehensive text-books. The book is one of extreme interest, and the titles of certain chapters will indicate its outlook: "Arabia, the land of plunderers; Anatolia, the land of the sunrise; Siberia, the most American country in Asia." The author has attained his end in describing the life of the people, often from first-hand knowledge, in such a way as to emphasize the importance of the geographical environment.

'A Text-book of Geography.' By R. M. Munro. (Edinburgh: John Cormack. Pp. xvi., 480. 434 *Maps, Diagrams, and Illustrations: many maps in colours.* 3*s.* 6*d. net.*) This book is styled by the author practical and physical, and aims at presenting a reasoned account of the chief facts of astronomical, mathematical, physical, practical, biological, commercial, and historical geography. In the way in which the work covers so much ground the book is reminiscent of the text-books of twenty years ago: although some of the subject-matter betrays more modern tendencies. The book is distinctly not human, and is out of touch with the modern notion that school geography should deal with the Earth as the home of man; at the same time, the author has raised his book beyond the old level of descriptive texts about more or less interesting concrete objects, by providing the material from which the pupil may draw inductively conclusions regarding the main principles of geography. No discussion of separate countries, continents, or distinctive areas is attempted. The use of colours in some of the many illustrations is effective, but the diagram in illustration of the monsoon winds of the Indian ocean lacks close relation to the actual facts of wind movement, and the picture of sheep-shearing is hardly modern.

B. C. W.

THE MONTHLY RECORD.

EUROPE.

A Problem of Early Irish Topography.—Mr. G. H. Orpen has an interesting paper in the *Proceedings* of the Royal Irish Academy (vol. **32**, Sect. C, No. 3, 1913), on the *Dún Galion*, an ancient fortress, referred to in the 'Book of Leinster' as existing in the territory known as *Dal Messi Corb*, and traditionally associated with a foreign people called Galioin, or Galians. This he proposes to identify, on the one hand with the ruined fort of Rathgall in county Wicklow, and on the other with the Dunum of Ptolemy, placed by that writer in the inland parts of South-East Ireland. His reasoning is ingenious and plausible, though conjecture necessarily enters into it to a large extent, and he admits that the last word has not been said on the subject. The district called Dal Messi Corb in some ancient writings took its name, either in fact or legend, from Messi Corb, one of the four sons of Cucorb, an early King of Leinster; and from a study of such evidence as is available, Mr. Orpen concludes that it covered a large area in North Leinster, and that it probably included at least the whole southern part of county Wicklow, and may thus have well comprised Rathgall. The strangers (Galians), from whom the fort was named, are said to have been brought in (probably about the third century B.C.) by Labraid the exile, and it was from the broad lances (*laighne*) used by them that the *Laijin* (Leinster men) were so called. Mr. Orpen thinks that this story of the introduction of a foreign people into Leinster enshrines an historical fact; though whether they came from the south of Britain or from Gaul, or from both, cannot be decided. One version has it that they came from Menia (possibly = Menapia), and there are reasons for thinking the Manapians of Ptolemy to be a branch of the Galians. His town, Manapia, has generally been identified with Wexford, but Mr. Orpen shows that there are difficulties in the way of accepting this, and he places it rather at Arklow, Ptolemy's Modonnus being in this case the Ovoca. Manapia has also been placed somewhere near Arklow by Sir J. Rhys. Dunum is placed by Ptolemy inland in almost the same latitude as Menapia, and its position relatively to the latter is precisely that of Rathgall relatively to Arklow. While allowing that these are but conjectures, Mr. Orpen claims that they at least harmonize with each other and with tradition, and "account for certain archæological objects and certain topographical names."

Lake Castañeda, Spain, and Evidences of Former Glaciation.—Spain is so lacking in fresh-water lakes that its largest example, Lake Castañeda, in the province of Zamora (Leon), has an area of less than a square mile. Very little has hitherto been known with precision as to the morphological features of the lake, though the reported evidences of past glacial action in its neighbourhood have justified the presumption that it owed its origin to former glaciation. As mentioned in the *Journal*, vol. **40**, p. 642, the well-known German limnologist, Prof. W. Halbfass, made a scientific study of the lake and its neighbourhood in 1912, and he has now given the results of his soundings and other observations (carried out with the help of Herr Adolf Ollerich) in *Petermanns Mitteilungen* for December, 1913. The lake lies in a little-frequented region, and is reached only after a journey of over 60 miles, by road and bridle-track, from Benavente on the Astorga-Salamanca-Plasencia railway. The region is clothed with heath, or with pine and oak scrub, though fine examples of *Castanea sativa* and *Juglans regia* occur near the villages. The former, which evidently gave its name to the lake, must once have been more abundant. In the absence of any trustworthy maps of the lake Prof. Halbfass had

first to execute a rough survey himself, which he did by taking bearings with a small theodolite and determining distances by measurement, or (in the case of sections across the lake) by counting the oar-strokes during the passage. The dimensions proved to be considerably smaller than those usually assigned, the greatest length being little over 2 kilometres. The greatest depth found was about 50 metres (164 feet), which merely represents the deepest part of a considerable area over 45 metres. The sides fall remarkably steeply, and the mean depth reaches the unusually high proportion of over 60 per cent. of the maximum. The shores, too, are generally high and steep. Prof. Halbfass gives a detailed description of the glacial features of the whole neighbourhood, which leave little doubt that the lake is a product of the final stages of the Glacial epoch. They consist in the still clearly traceable moraines and other glacial deposits, as well as in the steep and smoothed sides of the valleys. The masses of ice and snow seem to have descended from the plateau-surface of the so-called Sierra Segundera by four main valleys, in which other small glacial lakes occur.

A Descent into the Crater of Vesuvius: Prospect of Eruption.—Mr. Frederick Burlingham, who lately carried out a successful descent into the crater of Vesuvius with a heavy apparatus for the purpose of securing kinematograph films, has communicated to the *Times* an account of his experiences and of the lessons to be learnt from his observations. He says that Vesuvius is no doubt getting ready for a new eruption. The main conduit, which had been obstructed as a result of the paroxysm of 1906, suddenly opened in July last, forming a new mouth 50 feet in diameter. From this, dense volumes of smoke are issuing with ever-increasing activity, while minor explosions are taking place, and there is evidence that the lava in the interior is rising rapidly. Mr. Burlingham anticipates that, on lava being ejected from the mouth, a growing cone will be formed inside the present crater (1200 feet deep), increasing in height until it may rise well above the crater walls, to be eventually destroyed with the accompaniment of lateral flows of lava. Another possibility is that with the increasing pressure the lava may find some line of weakness in the side of the present cone, or even make an outlet at a considerable distance from the crater. As regards the dangers of a descent, these, he says, have been overestimated, the risk being hardly greater than those constantly faced by Alpinists. The greatest danger is that of avalanches and falling stones, the whole of the inner slopes being in a state of very unstable equilibrium. A second is that of asphyxiation, which is increased when a wind arises, disturbing the regular ascent of the main column of smoke. This occurred during Mr. Burlingham's descent, but by covering their mouths with cloth he and his Italian companions saved themselves from choking. On the south wall, 800 or 900 feet below the crater's rim, several primary fumaroles, solfataric in character, were noticed. They are vents connected with the volcano itself, and discharge heated gases. In some there are grottoes encrusted with a white substance, which also occurs around the newly-formed mouth. Some curious yellow substances with vermilion incrustations were also secured. From the lowest abyss dense clouds of incandescent pink smoke rush out with a hollow roar. They flashed several colours, greenish tints suggesting copper fumes. The dust or ash obtained from the edge of the abyss was salty in taste.

ASIA.

Expedition to Mount Menuang Kasing, Selangor.—An expedition to this mountain, carried out by Mr. Henry N. Ridley and Mr. C. B. Kloss, is

described in the *Journal of the Linnean Society*, vol. 41, Botany. The mountain in question is one of the peaks of the range which forms the backbone of the Federated Malay States, and is near the boundaries of the states of Selangor, Perak, and Negri Sembilan. The summit is a somewhat steep peak, rising to a height of 4908 feet above hills of only slightly inferior altitude. Although the mountain is separated on the north from the more massive portions of the main range by passes 2000 feet high, it yet possesses a true mountain fauna. To the south of Mount Menuang Kasing the range becomes gradually broken up into more or less isolated groups of hills of generally lower altitude, and it is only to those in the immediate neighbourhood that the high-level fauna is known to extend. The mountain possesses also a high-level flora, and the plants collected by Mr. Kloss on this expedition are described in the paper under notice. The collection was made in the course of a four or five days' visit in February, 1912. The travellers made a palm-leaf shelter on a flat knoll on the mountain-side, and even at that moderate altitude they found the nights extremely cold owing to a high wind which blew across the ridge. Save for the occurrence of "Job's tears" (*Coix lachryma Jobi*) at 1350 feet, the commencement of the Giant Bamboo zone at 2000 feet, and an unexpected show of Cannas in a Sakai clearing at 1000 feet, little of botanical interest was noted till the highest collecting ground (above 3000 feet) was reached. Although the ridges were swampy, the summit of Menuang Kasing itself, being of conical form, was quite dry, and was principally covered with myrtles, pitcher-plants, and long grasses. At this altitude yellow Balsam (*Impatiens oncidioides*), dense draperies of moss, orchids, and a small-leaved creeping plant (*Pratia begoniæfolia*) were much in evidence.

Volcanic Eruption in Japan.—A volcanic outburst of unusual violence and destructiveness occurred about the middle of January near the southern end of Kuishui, Japan. Telegrams sent from Kagoshima on the 13th reported that from the 10th onwards some sixty or seventy earthquake shocks had been experienced daily, culminating on the 12th in a terrific eruption of the volcano of Sakura Shima, on an island in the Gulf of Kagoshima, which had previously remained dormant for 130 years. This appears to have first shown signs of activity on January 10, but the main eruption is said to have been on the 12th. Enormous columns of smoke and flame burst from many parts of the mountain side and soon enveloped the whole island, while lava-streams descended in various directions, overwhelming the villages in their way. Enormous blocks of stone were thrown to a height estimated at over 2700 feet, some falling at a distance of 20 miles. The heat was intense, and could be felt in Kagoshima, which was itself set on fire, according to one account, by the masses of lava ejected, and enveloped in dense smoke. Aided by the craft in the intervening channel, which assisted heroically in the work of rescue, the survivors from the island fled to Kagoshima, but when this proved no secure retreat, the whole of its inhabitants likewise fled northwards, leaving the city deserted. Many lives were lost, principally in the villages in Sakura Shima overwhelmed by the lava-flows, though some are reported as drowned while attempting to swim across to Kagoshima, and others are said to have fallen victims to a tidal wave, and the destruction of houses by the earthquake shocks, which were felt over the whole of Kiushiu province. A thick layer of ashes fell in Nagasaki, and a fall was likewise experienced at places as distant as Osaka and Ogasawara. The total death-roll proved to be less than was at first feared, being now placed at probably not over six hundred.

The Hwang-ho and its Changes.—Under the title 'Die Laufänderungen des Gelben Flusses in Historischen Zeit' (Nürnberg, 1912) Dr. Jakob Menauer makes a careful attempt to describe from all available sources the extraordinary vagaries and divergencies which, as is well known, have characterized the course of the Yellow river from the earliest historical times. To review in anything like detail the movements in question is quite beyond the scope of a brief notice, but summarizing the same it may be mentioned that the waters of the Yellow river discharged themselves northwards into the Gulf of Pechili during three distinct epochs, viz. from 2300 B.C. to 361 B.C., from 132 B.C. to 1289 A.D., and from 1852 to the present time, or for a total period of 3420 years, during which the mouths of the river were gradually shifted southwards from 39° (or according to Richthofen 39° 30′) N. lat. to about 37° 30′ N. lat. The more southern course, with its outlet in the Yellow sea, existed from 361 B.C. to 132 B.C., and from 1289 A.D. to 1852, periods amounting altogether to 792 years. Many scientific men are of opinion that the north-eastern course is the natural one, while others hold that this is rightly said of the southern course. In any case, however, it is clear that the stream under some pressure was forced away to the south, and that the north-eastern course, although it lasted four times as long as the other, had to be artificially regulated to a far greater extent than the southern. According to the opinions of the Chinese, the occurrence of frequent inundations betokens the approaching end of the existing dynasty. At such times the tanks and dams of the Yellow river are no longer properly cared for and kept in repair. During the summer of 1911 the Hwang-ho was subject to a great inundation which caused great loss of life and widespread disaster. Was this purely the work of nature? Or was it due to the dams being neglected and not watched, perhaps owing to the misuse of the funds set apart for their proper maintenance? Anyhow, the far-reaching constitutional upheaval that followed was, undoubtedly, *post hoc*, if not exactly *propter hoc*. The concluding part of this work deals with the physical conditions and features of Central Asia and Northern China which have led to the changes of the river's course, with special reference to the particular occurrences and combination of causes which have brought about the great changes of the separate epochs. The memoir is evidently the result of considerable research, and is useful as bringing together a body of facts not easily accessible elsewhere in a convenient form.

AFRICA.

The Sierra Leone—French Guinea Frontier.—A final agreement defining this frontier in accordance with the demarcation carried out in 1912 by Captains Le Mesurier and Schwartz on behalf of the two Powers interested was signed in London on September 4, 1913, and has since been published as Treaty Series, 1913, No. 19. In all important particulars the line exactly agrees with that laid down in the agreement of 1911 (*Journal*, vol. 40, p. 643), but it is now defined in greater detail, and an understanding is reached as to the ownership of islands in the rivers forming parts of the boundary, and the rights of the natives as regards fishing, etc. The intersection of the Moa river by the 13th meridian west of Paris (where the boundary crosses from one bank to the other) has been marked by cairns, and it is understood that the line shall not be affected by any errors that may be discovered in the determination of this intersection. A large-scale map shows the course of the boundary in detail.

United Nigeria.—The formal amalgamation of Northern and Southern Nigeria under one administration took effect on January 1, 1914, Sir Frederick Lugard becoming the first Governor-General of the united territory. The

occasion was celebrated by the receipt of a telegram sent by the King through the Colonial Office, in which His Majesty conveyed to the emirs, chiefs, and all the inhabitants his best wishes for their future happiness and prosperity. A suitable reply was sent by the Governor-General, between whom and the Secretary of State for the Colonies telegrams were also exchanged. The whole territory has an estimated population of about 17,000,000, and embraces the whole of the former sphere of action of the Royal Niger Company, as well as the former colonies and protectorates directly under the British Crown which occupied the coast-line. Of these the original "Oil Rivers Protectorate" became enlarged in 1893 to form the "Niger Coast Protectorate," which in turn became the "Protectorate of Southern Nigeria" on the surrender of its charter by the Royal Niger Company in 1900. The old colony of Lagos had been united with Southern Nigeria in 1906.

French Hydrographical Expedition to the Congo.—The mission organized in 1910 under Naval Engineer H. Roussilhe for the thorough study of the main waterways of that part of the Congo basin falling within French Equatorial Africa has already been referred to in the *Journal*. After ten months of strenuous labour most of the work entrusted to the mission was completed in October, 1911, though the examination of the Ubangi has since been continued by Lieuts. Planchat and Vivien. In addition to the publication of a number of charts of the rivers, a detailed report has been drawn up, an outline of which is given by M. Roussilhe in *La Géographie* for August, 1913. This shows that additions of great value to our knowledge of the *régime* of the Congo and its affluents have been made, comparable to previous contributions of the same kind by French investigators of the Senegal and Niger. Particularly useful are the data regarding the phases of rise and fall on the middle Congo and its northern affluents. The flood both of the Sanga and Ubangi is of the Nilotic type, with one period of low water (in April) and one of high (in October). The mean rate of passage of the flood down stream is, for both rivers, 100 kilometres per day. Both have their sources in a similar meteorological zone (5° to 6° N.), and both receive few feeders of importance in their lower courses. On the Congo itself the phenomena are more complex by reason of the important influence exercised by the upper river and the Kasai, which are subject to two annual floods and two periods of low-water. Still the flood of the northern tributaries makes its influence felt in the main river in the exaggeration of the November—December flood, as compared with that in May and June. The mission carried out for the first time a thorough examination of the waterway of the Congo and Ubangi from the point of view of navigation, and the large number of soundings taken permit a statement of the present possibilities in this direction, and the most desirable steps for future improvement. On the main river vessels of 500 to 1000 tons, drawing 10 to 16 feet, can ply at all times. On the lower Ubangi the draught must not exceed 10 feet at extreme low water, and higher up it must be diminished successively to 6 feet 6 inches and 4 feet at the same stage. But vessels drawing 5 feet 6 inches can almost always navigate the two rivers from Brazzaville to Bangi—a distance of 1168 kilometres. In spite of the inconvenience of transshipment, it would probably be best to use vessels of the greatest draught admissible for each section, and it is also advisable to adopt a different type of vessel for passengers and goods. A particularly careful study was made of the conditions in and about Stanley pool, and precise measurements of the cross-section, angle of fall, rate of flow, and discharge of the river were for the first time made. The low-water discharge just above the pool

works out at 30,000 cubic metres, or just over 1,000,000 cubic feet per second; but it rises to 52,000 cubic metres at high water. M. Roussilhe suggests measures for the improvement of the waterway along the French shore of Stanley pool and for the construction of a suitable port for Brazzaville. He urges that the work should be taken in hand promptly so as to be ready by the time the railway from Pointe Noire to Brazzaville is completed. A permanent organization for the survey of the shifting river-channels is also held to be a necessity.

Boundaries of the Belgian Congo.—Two minor points in regard to the frontiers of the Belgian Congo with Portuguese territory have lately been settled. The one is in the region of the divide between the upper Kasai and Zambezi basins, where, by the agreement of 1891, the frontier was laid down as following an affluent of the Kasai from Lake Dilolo, under the mistaken belief that this lake lay on the water-parting. When this was found to be erroneous a difficulty arose as to the precise affluent of the Kasai which should form the boundary here, Portugal claiming the Luao, while the Congo authorities held to the Luakanu, further west. The matter was settled by an exchange of notes in 1910, but does not seem to have become generally known at the time. The text of the Belgian note (which was accepted by Portugal), with an accompanying sketch-map, appears in the *Mouvement Géographique* for November 23, 1913. The frontier follows the Kasai to its junction with the Luakanu, and then the latter and an eastern tributary to a place on the water-parting known as Shakalumbo. The frontier of the Portuguese enclave of Kabinda has also been somewhat uncertain, especially as regards its southern termination on the ocean. It is announced, however, in the *Mouvement* for November 16, that a protocol defining the whole frontier of this enclave with the Belgian territory, on the basis of the report of the joint delimitation commission of 1900–02, was signed at Brussels on July 5, 1913.

Tides and Currents on East Coast of Africa: Errata.—Owing to Mr. Allanby's absence from England, his corrections to the proof of his communication printed in the December number of the *Journal* (p. 580) were not received until after the number had gone to press. The following should be made. In paragraphs 5 and 6, *for* Mafanudi *read* Mafamede throughout. In paragraph 5, lines 3 and 4, *read*: "... high water Angoche 7.30 p.m. At 11 p.m. St. George island light," etc.

AMERICA.

North American Freshwater Fauna and Changes in River Systems.—In a paper printed in the *Proceedings* of the American Philosophical Society, Dr. A. E. Ortmann discusses at length the influence exercised by the Alleghenian divide upon the distribution of the freshwater fauna of that part of the continent, bringing out incidentally the way in which questions of physiography can be elucidated by the help of zoogeographical evidence. The writer first records the facts in regard to the distribution of the fauna which he has ascertained by extended research in the field, paying special attention to the *Najades* or freshwater mussels as forms which apparently possess no exceptional means of dispersal, being unable, as a rule, to cross from one drainage system to another overland. He then briefly summarizes the physical history of the Allegheny mountain region through the cycles of upheaval and erosion which have brought into existence the various natural zones into which it may be divided. Stream capture has exercised an important influence, and as the original divide was well to the east, so that the shorter eastern streams had a steeper

grade and greater eroding power than those flowing west into the interior basin, the former had the first chance of sawing through the divides westward. It is thus a general law that the Atlantic streams have the tendency to cut into and encroach upon the region which originally drained westward. They have also been subject to stream-capture between themselves. A consideration of the physical history enables the writer to account, one by one, for the main distributional facts previously laid down as needing explanation, and among the general results of the study are the following. The Allegheny system forms an old and well-marked boundary between aquatic animals inhabiting the interior basin and the Atlantic slope. The Ohio basin shows a generally uniform fauna, especially in its upper parts, and this uniformity has been acquired in post-glacial times. There are also the remnants of an older, pre-glacial, faunistic differentiation, especially in the Tennessee-Cumberland drainage. The faunistic evidence shows, however, that various streams, such as the Big Sandy river, the Licking river, and possibly the Kentucky river, belong to the upper Ohio basin. The Atlantic fauna is a distinct though secondary one, derived originally from that of the interior basin, and is composed of two main elements, a northern and a southern. Dispersal both northward and southward was here possible, owing to the removal of barriers by base-levelling and in a minor degree to stream piracy in the uplands. In the mountains cases occur which indicate crossing of the divide, and may be regarded as evidence of stream capture.

Deep Boring in Ohio.—A deep boring was carried out in 1912 at Findlay, Ohio, in the midst of the Trenton oil and gas field, with the view of testing the deeper strata as a possible source of oil. Advantage was taken by the U.S. Geological Survey to study the geology of the bore-hole and also, through the co-operation of Dr. J. Johnston of the Carnegie Geographical Laboratory, to obtain a record of the temperature gradient in the well. The results are given in the *American Journal of Science* for August, 1913, supplemented by those from other wells in the same district. The base of the "Trenton" limestone formation was reached at 2755 feet, and soon after this the drill struck a very hard granite of Pre-Cambrian age. The base of the Palæozoic had never before been reached in this part of the United States, and the records are therefore of unusual geologic interest. The temperature gradient was found to be generally regular, apart from a marked discontinuity at the level (770 feet) at which a flow of gas occurred; the cooling of the gas by expansion reducing the temperature in the upper portion. Below the above-mentioned level, from the "Trenton" limestone downwards, the gradient was found to be 0·74° Fahr. per 100 feet in the sedimentary rocks, but was apparently somewhat higher in the crystalline rocks. The corrected average temperature of the rock at the bottom (2980 feet) was 82·1 Fahr.

The Brazil-Bolivia Boundary Survey.—News has been received from Commander H. A. Edwards, of the Bolivian section of the above boundary survey commission, dated "Fortaleya Falls, River Abuna, Bolivia, November 25, 1913." Commander Edwards notes with satisfaction that it has been found possible to carry the longitude by means of wireless telegraphy right into the heart of the Amazonian forests, time signals having been received repeatedly from Mr. Atkinson at Porto Velho, the starting-point of the Madeira-Mamore railway,* although only a light travelling receiving set was used, made up

* The determination by wireless of the longitude Manaos—Porto Velho was referred to in vol. **42**, p. 496, where the boundary was accidentally spoken of as between Peru (for Brazil) and Bolivia.

locally with wires stretched between trees. Between Porto Velho and the stations on the Rios Rapirran and Abuna there is no break in the Amazonian forests, but the signals were perfectly receivable in small clearings. Other signals were heard from Lima and Iquitos. The applications of wireless telegraphy to expeditions for exploratory surveys opens up visions of new possibilities in which chronometers are relegated to a place of secondary importance. The party was about to start for Villa Bella on the Madeira, but only to set up boundary marks. The rainy season was in progress, and it would probably be impossible to carry out the survey of the Madeira for the present, as triangulation would be needed for this and good weather would be indispensable. General Pando had retired from the Bolivian commission, leaving Commander Edwards in charge.

AUSTRALASIA AND PACIFIC ISLANDS.

Dutch Exploration in New Guinea.—The November number of the *Tijdschrift* of the Netherlands Geographical Society contains some interesting items respecting recent explorations in Dutch New Guinea. A short extract from a report by Captain Herderschee on his ascent of Mount Wilhelmina in February, 1913, describes the final portion of the climb (cf. *Journal*, vol. 42, p. 81) made up the steep limestone cliff by which the mountain falls to the south. The thickness of the snow (*névé*) varied from 0·3 to 3 metres, and beneath this was a layer of ice 3 to 5 metres thick. A provisional calculation of the hypsometer observations gave an altitude of 4700 metres (15,420 feet). Mount Carstensz was visible in the west, while to the north the mountains seemed less rugged than the country traversed during the ascent. At 25 miles' distance, in the direction N. 20° E., there extended a very broad valley with almost the character of a plateau. Photographs were secured during the hour spent on the summit. A report on the geology of the mountain and its neighbourhood, by P. Hubrecht, geologist to the party, is also printed. In the north of Dutch territory an exploration was carried out in the first half of 1913, under the orders of Captain Ten Kloǫster, in the unknown country south and south-east of Geelvink bay, principally with a view to determining the relations of the three great mountain systems of this part of the island—the Nassau, Charles Louis, and Weyland ranges. One party, starting from the head of the bay, reached the point of union of the three ranges, at an altitude of 2900 metres (9515 feet) on the divide between the west and south. A peak of 3240 metres (10,630 feet), furrowed by deep ravines, was climbed in its neighbourhood. Many birds of paradise and cockatoos were seen, but few inhabitants. Some individuals of the Jabi tribe were encountered, but they at once took to flight. Another party, working more to the west, crossed the water-parting in the direction of Etna bay on the south coast, finding the highest point of the range to reach an altitude of 3700 metres (12,140 feet). In the absence of guides the return was made under great difficulties. The distant views and rounds of angles obtained by the two parties throw much new light on the general features of this region. The first party saw to the east and south-east an even, burnt-up country bare of trees, but more mountains to the north and north-east. In the south-east of Dutch territory results of some value have been gained by the exploring expedition to the upper branches of the Digul river, under Captain Weyermann. The main tributary, known as the Uvimera or Kaoh, traverses a well-peopled district, plantations being constantly seen along its banks. These were generally high, and the stream was much broken by waterfalls. Friendly relations were established with the people, who had never before come in contact with Europeans. The

central range rose in front like a wall, and the bearings taken of its many peaks and ridges have permitted the construction of a map which will be of great use in the event of the exploration of the range, or a journey across it to the north coast. It is the work of Lieut. J. L. Chaillet, and a reduction on the scale of 1 : 500,000 is given in the *Tijdschrift*. The height of Mount Juliana, the highest peak in this part of the range, was found to be 4721 metres (15,488 feet).

Exploration in Papua.—News was received in this country towards the end of last year of the return of the Massey-Baker Government expedition to the basin of the Fly river, all the members having suffered severely from the hardships undergone. The object of the expedition was the location of centres of population and the establishment of Government posts. In the vessel placed at its disposal it ascended the Fly river to the tidal limit 200 miles up, whence further trips were made by the launch and whale-boat. An extensive lake was discovered, and natives were encountered, who however were very wild. The illness of the leader and other members of the expedition then made a return necessary. It is also stated that a new expedition has been sent to explore the district between the Kikori and Strickland rivers, in part the scene of the trying experiences of the former expedition under Mr. Staniforth Smith (*Journal*, vol. **39**, p. 313). This time the party is under the leadership of Mr. H. J. Ryan, and the plan is said to be to construct rafts on reaching the Strickland and float down that stream and the Fly river to the sea.

Volcanic Eruption in the New Hebrides.—A violent eruption of the volcano on the island of Ambrym, one of a group noted for the many outbursts of volcanic activity since their first discovery by Europeans, took place early in December. It is stated that on the 6th, six new craters were formed on the west coast, and that on the following day Mount Minnie collapsed in the centre. The mission and hospital were threatened, and many of the natives took to their canoes, while the old and decrepit were rescued by a steamer. It is supposed that many lives of natives must have been lost in the interior, where outbreaks of fire occurred, while the rivers became torrents of glowing lava. It is stated in the later accounts that the site of the British mission and hospital are now far beneath the sea, the inmates of the latter being saved only by the promptitude and courage of Dr. Bowie, the medical officer. In another place the former sea-bed now forms hilly country. The sea itself was violently agitated, and so hot that fish rose to the surface cooked. The most violent eruption previously recorded was that of 1894, described by Commander (now Rear-Admiral) Purey Cust, before the Society in 1896 (*Journal*, vol. **8**, p. 585, with map of the island and illustrations). Ambrym is entirely volcanic, its present form suggesting that it is merely the truncated remnant of a vast mountain, possibly 10,000 feet high. The centre forms a plain of ashes 2000 feet above sea-level, the two highest summits, Marum and Benbow, rising near its western end. Both contain huge craters. Mount Minnie, above referred to, is near the western extremity of the island.

POLAR REGIONS.

Austrian Antarctic Expedition.—In connection with Sir E. Shackleton's projected British expedition, it may be recalled that the Austrian expedition under Dr. König (*Journal*, vol. **42**, p. 300), which hopes to sail from Trieste in the early summer, proposes to fix its base of operations in much the same region as Sir Ernest, though the plans laid down do not include anything quite so sensational as a march right across the Antarctic continent. Dr. König

described his programme and the present position of the preparations at a meeting of his Committee on January 16, but the telegraphic reports of the meeting do not add much to the details already made public. Of the total sum required (£25,000) only about half had so far been obtained. The name of the vessel selected, which is that used by the recent German expedition, will be changed from *Deutschland* to *Oesterreich*. After touching at Buenos Aires, the expedition will proceed to South Georgia, where an intermediate station will be installed, fitted with wireless apparatus, by which means it is hoped to keep up communication with civilization throughout. As previously announced, the base will be established in a bay of the ice-barrier discovered by the Filchner expedition, and the principal work will be done by sledge journeys in three directions, one towards the Queen Maud mountains, one towards Graham Land, with a view to tracing its southward continuation, and one towards the Enderby quadrant. Among the special objects of investigation will be the mutual relations of the east and west sections of Antarctica. Dr. König thinks that success can be attained only by adopting the habits and means of progression of the Eskimo. The expedition is expected to cover two years, but will be provisioned for three.

The Arctic Ice in 1912.—The Nautical Meteorological Annual of the Danish Meteorological Institute for 1912 contains, as usual, information, based upon the reports of institutions and explorers, concerning the state of the ice in the Arctic seas. The winter of 1911–12 was mild in Greenland and the region of Bering strait, but severe in the European Arctic waters. There was much ice in the White sea, which was still full of ice in June, whilst the Kara sea was unapproachable all through the summer. Information was lacking from the coast of Novaya Zemlia. In the Barents sea the quantity of ice was so great that the edge of the ice was lying much more westerly and southerly than usual during the summer, and during August the weather was so inclement that the ice on the pools on the floes was 25 centimetres thick. In Spitsbergen the fiords on the west coast were blocked all through the month of August by masses of ice from the Barents sea, whereas in normal years the west coast is free from ice at that season. The German expedition under Schröder-Stranz, after trying to work up the east coast, had to give up the attempt. No information had been received as to the north coast of Spitsbergen. The edge of the ice along the east coast of Greenland in lat. 75°-79° N. remained throughout the summer in long. 50° E. In July the *Godthaab*, notwithstanding very heavy ice, succeeded in landing Captain Koch's expedition at Shannon island. At Angmagsalik the coast was ice-free in August and September, and from July 22 ships were able to touch at the station. It thus appears that no extensive southward drift took place in the course of the year of the vast masses of ice that were lying farther north. The coast of Iceland remained free throughout the year, but from April to August scattered ice was observed 30 miles off Cape North. The first ice entered Davis strait early in December, after rounding Cape Farewell, and vast quantities appeared in January and February. Along the south-west coast of Greenland the conditions were normal. In north Greenland the winter ice was weak, and drifted away early. On the Newfoundland banks the ice advanced farther south than in any year since 1897. Both bergs and floes were observed below 37° N., but neither reached so far east in 1912 as in many other years. The difficult state of ice on the Banks in 1912 was possibly connected with the great accumulation in the western part of Davis strait in the summer of 1911. Floes were observed from February to July, and bergs from January, and the number of reports culminated

in May with 1100, as against a maximum in 1911 of 475 in July. About Belle Isle strait icebergs were numerous during the year, but there seems to have been little ice in the Bering sea and strait.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Desideratum in Map-making.—At the Rome meeting of the International Geographical Congress a resolution was passed on the proposition of General Shokalsky urging the desirability that all maps, whether issued separately or accompanying scientific memoirs, should be provided with a detailed statement of the scale, the system or projection adopted, the materials on which it is based, and so on. The value of such information to users of maps is obvious, and it is to be hoped that the reform may in time be generally adopted.

Atlas of Forms of Terrestrial Relief.—The scheme for the issue of a collection of plates illustrating the forms of terrestrial relief, first formulated by Prof. Emile Chaix, and adopted at his instance by the International Geographical Congress at the Geneva meeting in 1908, has more than once been referred to in the *Journal* (vol. 37, p. 217; 39, 141). A report of progress was submitted to the same Congress at the Rome meeting last year, and the following resolution was adopted, on the motion of General Shokalsky: "Le X^{ème} Congrès International de Géographie approuve le dévelopment donné au projet de l'Atlas de formes du relief terrestre et le commencement d'exécution de l'œuvre. Il recommande vivement à tous les géographes et aux institutions scientifiques d'aider cette entreprise de toute manière." In circulating this resolution the Central Office of the Congress appeals to all geographers and geographical bodies to co-operate so far as may be possible with those in charge of the work. We cordially endorse this appeal, which deserves to meet a wide response, in view of the need of such an atlas felt by all students of geography, and the admirable manner in which the proposed undertaking promises to meet that need.

GENERAL.

Captain Scott's Journals.—The original journals kept by Captain Scott during his last expedition have been deposited by Lady Scott in the British Museum.

The Birthplace of Christopher Columbus.—It is remarkable with what avidity any new and heterodox views that may be put forward on a subject like that of the birthplace of Columbus are accepted by a section of the public. During the past fifteen years attempts have been made in various quarters to discredit the accepted opinion that the great navigator was a Genoese, and to prove that he was, according to one theory a Spanish Jew, according to another a Corsican. The refutation of such heresies might be thought an unnecessary task, were it not that their exponents—one of them at least a man of considerable literary standing—appear to find ready converts among those not acquainted with the actual evidence, and that there is therefore a risk of the public being led astray by the specious if ill-founded arguments put forward. The last champion of the Spanish origin of the Columbus family is Dr. C. de Horta y Prado, who, with a view to gaining as wide acceptance as possible for the theory, has issued a pamphlet ('La verdadera Cuna de Cristobal Colon'; New York: J. B. Jonathan, 1912) in an edition of 25,000 copies, which have been distributed broadcast throughout the civilized world. A refutation of this and other recent speculations on the origin of Columbus has been undertaken by Mons. H. Vignaud in the *Revue Critique d'Histoire et de*

Littérature, and a reprint of the paper (Paris : Leroux, 1913) has been received from the author. The claim of a Spanish (Galician) origin for the navigator was first made in 1898 by Don Celso Garcia de La Riega, and is based merely on the proved existence in Galicia in the fifteenth century (1) of a family Colon, some of whose members bore the same Christian names as those of Columbus and his relatives ; (2) of a family Fonterosa, certain members of which bore Jewish Christian names, among which the theorists therefore would place Suzanne Fontanarossa, mother of the navigator, although the latter name is definitely connected with that of a valley near Genoa. As M. Vignaud has no difficulty in showing, the new theory can only be maintained by those who are absolutely ignorant of the results of modern research as to the family and early history of Columbus, or who, knowing these in part, decline to accept as genuine all documentary evidence which runs counter to their preconceived notions. The claim for a Corsican origin, besides being of course quite incompatible with the other, suffers from precisely the same disabilities, and any impartial reader of M. Vignaud's paper will at once admit the hollowness of the whole case for either of the new theories.

OBITUARY.

Colonel D. D. Gaillard.

The late Lieut.-Colonel David Du Bose Gaillard, U.S. Army, was a member of the Isthmian Canal Commission and engineer in charge of the Central Division of the Panama canal, which includes the great Culebra cut. He was formerly employed upon works of river and harbour improvement, and had published a valuable book on water-power. In 1908, on my second visit to the Panama canal works, I found him installed as engineer in charge of the Culebra cut. Thanks to his organization, everything worked smoothly and rapidly, and the neatly terraced sides of the cut stood firmly. But when I next visited the canal, in 1910, the bottom of the cut was already upheaving. The rotting and disintegration of the rock went on so fast that the remedies could not keep pace with it, and in 1912, when I last went through the cut with Colonel Gaillard, the upheaval of the bottom and the collapse of the sides were still going on.

Gaillard had also been entrusted with the construction of the dyke connecting Naos island with the mainland, and here every foot subsided sometime after the material had been dumped. Thus, in the last four years of his life, he thought and laboured unceasingly upon an excavation of which the sides would not stand up, and a construction of which the foundation sank. He was an active, alert, and vigorous man in the prime of life. His intelligence was above the common, and his mind worked quickly. His great personal charm gave him many friends, and he had that wide range of intellectual interest which is so useful to a man burdened by an arduous task. But at last the strain broke him down. He left the Isthmus in August last, and from that time until his death in December he was in a state of partial or total stupor. Such a work as the dividing of a continent requires the sacrifice of men as well as money, and Gaillard spent himself willingly in the execution of his task.

VAUGHAN CORNISH.

Ferdinand Blumentritt.

The well-known authority on the Philippine islands, Ferdinand Blumentritt, died in September last, at Leitmeritz on the Elbe, in Bohemia. Born at Prague in 1853,

and educated in the same city, he came to Leitmeritz as a teacher in the "Staatsgymnasium" when only twenty-three, and so began an educational work in that town which continued until a couple of years ago, becoming in turn Professor and Director at the communal "Oberrealschul" there. His special subjects were geography and history, and he devoted special attention to the former Spanish colonies, especially the Philippines, of which his knowledge was almost unequalled, although derived from study at home and not from personal acquaintance with the country. A list of his most important writings accompanies an obituary notice in the *Oesterreichische Monatschrift für den Orient*, to which he was long a contributor.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1913–1914.

Fourth Meeting, December 16, 1913.—**The Right Hon. Earl Curzon of Kedleston, G.C.S.I., G.C.I.E., etc., President, in the Chair.**

The paper read was:—

"Explorations in the North-West Amazons' Valley." By Dr. Hamilton Rice.

Afternoon Meeting, December 18, 1913.—**Colonel Sir T. H. Holdich, K.C.M.G., K.C.I.E., Vice-President, in the Chair.**

The paper read was:—

"The Standardizing of Colours and Symbols representing Geographical Data, especially on Small-scale Maps." By Prof. A. J. Herbertson.

LECTURES TO YOUNG PEOPLE.

January 2, 1914.—"A New Playground in Vancouver Island." By Mrs. Henshaw.

January 5.—"How Some Rocks are made." By C. Carus-Wilson.

January 9.—"Glaciers." By Alan G. Ogilvie.

Fifth Meeting, January 12, 1914.—**The Right Hon. Earl Curzon of Kedleston, G.C.S.I., G.C.I.E., etc., President, in the Chair.**

Elections.—*Arthur Algernon Coldrey; Captain Hugh Carey Dickinson (3rd King's African Rifles); Arthur R. Farrer; Noel Fleischmann; Apsley Cherry Garrard; Mrs. Ella Maud Harrison; Colonel J. Charlton Humphreys; Albert Edmund Kent; Donald Macdonald, B.Sc.; Alfred O'Gormon Monkhouse; Colonel A. L. Phillips, I.A. (retired); Major Charles F. Preton Pinney; Joseph Albert de Rosse; Thomas John Taylor; T. H. Hillman Tildesley; John de la Valette; Francis Bertram Welch, M.A.*

The paper read was:—

"The Evolution of the Federal Capital, Australia—Canberra." By Griffith Taylor.

Afternoon Meeting, January 15, 1914.—**Douglas W. Freshfield, Esq., Vice-President, in the Chair.**

The paper read was:—

"Some Scientific Results of Captain Scott's Antarctic Expedition." By Griffith Taylor.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Greece. **Cassavetti.**

Hellas and the Balkan wars. By D. J. Cassavetti. London: T. Fisher Unwin, (1914). Size 9 × 6, pp. xv. and 368. *Maps, Plans, and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

Italy—Piedmont. **Canziani and Rhode.**

Piedmont. By Estella Canziani and Eleanour Rohde. London: Chatto & Windus, 1913. Size 11½ × 9, pp. viii. and 204. *Illustrations. Price* 21*s. net. Presented by the Publishers.*

Russia—Archangelsk. **Kertzell.**

S. V. Kertzell. On the Bolshezemelsk Tundra and its nomads. Archangel, 1911. Size 10½ × 7, pp. iv., 116, 6, and 13. *Map, Illustrations, and Diagrams.* [In Russian.]

Russia—Northern. *Ann. G.* **22** (1913): 245–254. **Legras.**

De Povênets à Arkhangel'sk. Par Jules Legras. *Sketch-maps.*

Russia—Urals. *Mém. Comité Géologique* N.S. **62** (1913): pp. vi. and 696. **Wissotzky.**

Die Platinseifengebiete von Iss- und Nischny-Tagil im Ural. Von N. Wyssotzky. *Maps and Illustrations.* [In Russian; German *résumé.*]

Southern Europe—Riviera. **Voigt.**

Die Riviera. Von Alban Voigt (Junk's Natur-Führer). Berlin: W. Junk, 1914. Size 6½ × 4½, pp. vi. and 466. *Plan and Illustrations. Presented by the Author.*

Spain—Morphology. *C.R.A. Sc. Paris* **156** (1913): 1794–1796. **Groth.**

Sur la bordure méridionale de la Meseta Ibérique. Par Jean Groth.

Sweden—Hydrology. **Hydrografiska Byrån.**

Hydrografiska Byrån: Årsbok, 3: för År 1911. Stockholm, 1913. Size 12½ × 9½, pp. xi. and 279. *Maps, Illustrations, and Diagrams.*

Sweden—Meteorology. *Ymer: Ts. Svenska S.G.* **33** (1913): 5–31. **Sandström.**
Meteorologiska forskningsresor i de svenska fjälltrakterna. Af J. W. Sandström. *Illustrations and Diagrams.*

Sweden—Winds. *Ymer: Ts. Svenska S.G.* **33** (1913): 32–38. **Hamberg.**
Några ord om luftcirkulationen i norra Sverige. Af Axel Hamberg.

Switzerland. **Walser.**
Landeskunde der Schweiz. Von Dr. Hermann Walser. 2. Auflage. Berlin: G. J. Göschen, 1914. Size 6½ × 4½, pp. 147. *Map and Illustrations. Price* 90 *pfg. Presented by the Publisher.*

Turkish Empire. **Miller.**
The Ottoman Empire, 1801–1913. By William Miller. (Cambridge Historical Series.) Cambridge: University Press, 1913. Size 7½ × 5, pp. xvi. and 547. *Maps. Price 7s. 6d. net. Presented by the Publishers.*

United Kingdom—Argyllshire—Geology. **Bailey.**
Quart. J. Geol. S. **69** (1913): 280–307.
The Loch Awe Syncline (Argyllshire). By Edward Battersby Bailey. *Sketch-map, Section, and Illustrations.*

United Kingdom—Historical. **Whatmore.**
Insulæ Britannicæ: the British Isles; their geography, history, and antiquities down to the close of the Roman period. By Arthur William Whatmore. London: Eliot Stock, 1913. Size 9 × 6, pp. xvi. and 375. *Maps. Price 20s. net. Presented by the Publisher.*

United Kingdom—Ireland—Pottery. **Westropp.**
P.R. Irish A. **32** (Sec. C) (1913): 1–28.
Notes on the pottery manufacture in Ireland. By M. S. Dudley Westropp. *Illustrations.*

United Kingdom—Kincardine. *T.R.S. Edinburgh* **48** (1912–13): 923–960. **Campbell.**
The geology of South-Eastern Kincardineshire. By Dr. Robert Campbell. *Sketch-maps, Diagrams, and Illustrations.*

United Kingdom—Loch Earn. *T.R.S. Edinburgh* **48** (1912–13): 629–696. **Wedderburn.**
Temperature observations in Loch Earn. With a further contribution to the hydrodynamical theory of the temperature seiche. By E. M. Wedderburn. *Sketch-map, Diagrams, and Illustrations.*

United Kingdom—Merionethshire. **Morris.**
Merionethshire. By A. Morris. (Cambridge County Geographies; edited by F. H. H. Guillemard.) Cambridge: University Press, 1913. Size 7½ × 5, pp. ix. and 166. *Maps, Illustrations, and Diagrams. Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—Northumberland. **Haselhurst.**
Northumberland. By S. Rennie Haselhurst. (Cambridge County Geographies; edited by F. H. H. Guillemard.) Cambridge: University Press, 1913. Size 7½ × 5¼, pp. xi. and 181. *Maps, Illustrations, and Diagrams. Price* 1*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Old river channel. *Geol. Mag.* V. **10** (1913): 414–416. **Irving.**
Note on a buried (East Mercian) river channel near Peterborough. By Dr. A. Irving.

United Kingdom—Scotland—Lochs. **Munro and others.**
Rep. Brit. Ass., Dundee, 1912 (1913): 204–224.
Artificial Islands in the Lochs of the Highlands of Scotland. Second report of the Committee consisting of Dr. R. Munro and others.

United Kingdom—Southampton Harbour. ——
Report of the Southampton Harbour Commission, with appendices and map. London: Wyman & Sons, 1912. Size 13 × 8½, pp. 40. *Price* 10*d.*

United Kingdom—Survey. **Ordnance Survey.**
Ordnance Survey. Professional papers, New series. No. 2. An investigation into the accuracy of the principal triangulation of the United Kingdom. By Captain H. St. J. L. Winterbotham, with an introduction by Colonel C. F. Close. London, 1913. Size 12½ × 10, pp. 20. *Sketch-map, Diagrams, and Illustrations.*

United Kingdom—Survey. **Ordnance Survey.**

Report of the progress of the Ordnance Survey to March 31, 1913. London: Wyman & Sons, 1913. Size 9½ × 6, pp. 24. *Index-charts and Illustrations. Price* 1*s.* 6*d.*

See note in the Monthly Record, November, 1913, p. 488.

ASIA.

China. **Bland.**

Recent events and present policies in China. By J. O. P. Bland. London: W. Heinemann, 1912. Size 10 × 6½, pp. xi. and 482. *Map and Illustrations. Price* 16*s. net.*

China—Yunnan. **Legendre.**

Mission A.-F. Legendre. Au Yunnan et dans le massif du Kin-ho (Fleuve d'Or). Par le Dr. A.-F. Legendre. 2e édn. Paris: Plon, 1913. Size 8 × 5, pp. xii. and 435. *Map and Illustrations. Price* 5 *fr. Presented by the Publishers.*

India—Historical. **Manucci and Irvine.**

A Pepys of Mogul India, 1653–1708; being an abridged edition of the 'Storia do Mogor' of Niccolao Manucci. Translated by William Irvine. London: John Murray, 1913. Size 9 × 5½, pp. and 310. *Portrait. Price* 10*s.* 6*d. net. Presented by the Publisher.*

India—Historical. **Sainsbury.**

A calendar of the Court minutes, etc., of the East India Company, 1650–1654. By Ethel Bruce Sainsbury; with an Introduction and Notes by William Foster. Oxford: Clarendon Press, 1913. Size 9 × 6, pp. xxxii. and 404. *Presented by the India Office.*

Mr. Foster's introduction supplies, as in the previous volumes, an excellent summary of the events and tendencies of the period dealt with.

India—Madras. **Thurston.**

The Madras presidency, with Mysore, Coorg, and the associated states. By Edgar Thurston. ('Provincial geographies of India.' General Editor: Sir T. H. Holland.) Cambridge: University Press, 1913. Size 8 × 5½, pp. xii. and 293. *Sketch-maps and Illustrations. Price* 3*s. net. Presented by the Publishers.*

Russia—Caucasus. **Rikli.**

Natur- und Kulturbilder aus den Kaukasusländern und Hocharmenien. Von Teilnehmern der Schweizerischen naturwissenschaftlichen Studienreise, Sommer 1912, unter Leitung von Prof. Dr. M. Rikli. Zürich: Artist. Inst. O. Füssli, 1914. Size 9 × 6, pp. viii. and 317. *Sketch-map and Illustrations. Price Mk.*8. *Presented by the Publishers.*

Russia—Caucasus. *La G., B.S.G. Paris* **28** (1913): 459–474. **Blanchard.**

La morphologie du Caucase. Par Raoul Blanchard.

Russia—Caucasus—Geology. **Riabinin.**

Mém. Comité Géol. N.S. Livr. **69** (1911): pp. 98.

Sur la structure géologique de la chaîne de Cahétie. Par A. Riabinin. *Map and Illustrations.* [In Russian; French *résumé.*]

Russia—Caucasus—Vegetation. **Rikli and Rübel.**

Vegetationsbilder (ed. Karsten and Schenck) **11** (1913): Plates 31–42.

Vegetationsbilder aus dem westlichen Kaukasus. (Urwälder, Hochstandenfluren, Alpenmatten.) Von Prof. Dr. M. Rikli und Dr. Eduard Rübel.

Russia—Siberia—Geology. **Geological Committee.**

Explorations géologiques et minières le long du Chemin de fer de Sibérie. Livraisons 22 (fasc. 2), 23 (fasc. 2), 26, 27, 28, 30, and 31. St. Petersburg, 1903–1910. Size 12½ × 9. *Maps, Illustrations, and Sections.* [In Russian.]

Russian Turkestan—Geology. **Mushketoff.**

D. Muschketov. The geological construction of East Fergana. (From the *Travaux de la Société Impériale des Naturalistes de St. Petersbourg*, vol. **43**, part i.) Yurief, 1912. Size 10 × 6½, pp. [9]. *Sketch-map.* [In Russian; English *résumé.*]

Siam. **Hosseus.**

Durch König Tschulalongkorns Reich: eine deutsche Siam-Expedition. Von Dr. Curt Carl Hosseus. Stuttgart: Strecker & Schröder, 1913. Size 12 × 9, pp. xii. and 219. *Sketch-map and Illustrations. Price Mk.*18. *Presented by the Publishers.*

Tibet. **Csoma de Körös and Ross.**

J. and P. Asiatic S. Bengal **7**, 1911 (1912): Extra No., pp. 172.

Tibetan studies: Being a reprint of the articles contributed to the Journal of the Asiatic Society of Bengal by Alexander Csoma de Körös. Edited by E. Denison Ross. *Portrait.*

Turkey—Archæology. **Thompson.**

A new decipherment of the Hittite Hieroglyphics. By R. Campbell Thompson. (From *Archæologia*, vol. **64**, 1912.) Oxford, 1913. Size 11½ × 9½, pp. 144.

Turkey—Palestine—Diseases. **Masterman.**

Notes on some Tropical diseases of Palestine. By Dr. E. W. G. Masterman. (From the *Journal of Hygiene*, vol. **13**, No. 1, April, 1913.) Cambridge, 1913. Size 10 × 7, pp. 49–62. *Diagram.*

Turkey—Stampalia Island. *B.S.G. Italiana* **2** (1913): 661–693, 787–816. **Martelli.**

L'Isola di Stampalia. Note geologiche e geografico-fisiche del socio Dott. Alessandro Martelli. *Map, Sections, and Illustrations.*

Turkey—Syria. *La G., B.S.G. Paris* **27** (1913): 161–196; **28** (1913): 429–458. **Torcy.**

Notes sur la Syrie. Par Général de Torcy. *Maps.*

AFRICA.

Egypt—Irrigation. **Willcocks and Craig.**

Egyptian irrigation. By Sir W. Willcocks and J. I. Craig. 3rd edit. Two vols. London: E. & F. N. Spon, 1913. Size 10½ × 7, pp. xxiv., x., and 884. *Maps, Sections, Diagrams, and Illustrations. Price* 42*s. net. Presented by the Publishers.*

Egypt and the Sudan. **Baedeker.**

Egypt and the Sûdân. Handbook for travellers by Karl Baedeker. 7th edit. Leipzig (London: T. Fisher Unwin), 1914. Size 6½ × 4¼, pp. cxc. and 458. *Maps, Plans, and Illustrations. Price* 15*s. net. Presented by the Editor.*

German East Africa. *M. Deuts. Schutzgebieten, Ergänzgsh.* **8** (1913): pp. 214. **Jaeger.**

Das Hochland der Riesenkrater und die umliegenden Hochländer Deutsch-Ostafrikas. Ergebnisse einer amtlichen Forschungsreise ins abflusslose Gebiet des nördlichen Deutsch-Ostafrika, 1906–07. Von Dr. Fritz Jaeger. Teil II.: Länderkundliche Beschreibung. *Map, Sections, and Illustrations.*

German East Africa. *Deutsches Kolonialblatt* **24** (1913): 746–755. **Schnee.**

Die nordwestlichen Gebiete Deutsch-Ostafrikas. Aus dem Reisebericht des Gouverneurs Dr. Schee.

Italian Somaliland. **Palazzo.**

Minist. Affari Esteri, Monogr. e Rapp. Col. (1912): No. 17, pp. 12.

La carta magnetica del Benadir. Nota del Prof. Luigi Palazzo. *Map.*

Madagascar. *La G., B.S.G. Paris* **28** (1913): 1–26. **Carrier.**

Une mission géodésique à Madagascar. Par Capitaine Carrier. *Sketch-maps, Sections, and Illustrations.*

Nigeria—Bornu. **Schultze and Benton.**

The Sultanate of Bornu. Translated from the German of Dr. A. Schultze . . . with additions and appendices by P. Askell Benton. London: H. Milford, 1913. Size 7 × 4½, pp. 401. *Map. Price* 7*s.* 6*d. net. Presented by the Publisher.*

Nigeria—Ethnology. **Thomas.**

Anthropological report on the Edo speaking peoples of Nigeria. By Northcote W. Thomas. Two vols. London: Harrison & Sons, 1910. Size 9 × 5½, pp. (Part 1), 163; (Part 2), ix. and 251. *Sketch-map. Presented for the Government of Southern Nigeria.*

Somaliland—Sport. **Mosse.**

My Somali book; a record of two shooting trips. By Captain A. H. E. Mosse. London: S. Low & Co., 1913. Size 9½ × 6, pp. xxv. and 315. *Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

South Africa. **Markham.**

The South African scene. By Violet R. Markham. London: Smith, Elder & Co., 1913. Size 9 × 5½, pp. viii. and 450. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

South Africa—Earthquakes. *T.R.S. South Africa* **3** (1913): 195–197. **Sutton.**

A note on the earthquake of the South African tableland. By Dr. J. R. Sutton.

South Africa—Historical. **Johnston.**

Pioneers in South Africa. By Sir Harry Johnston. London: Blackie & Son, 1914 [1913]. Size 8½ × 6, pp. 316. *Illustrations. Price* 6*s. Presented by the Publishers.*

Previous volumes of this attractive series have been noticed from time to time in the *Journal.*

South and East Africa. **Brown.**

The guide to South and East Africa. . . . Edited annually by A. Samler Brown and G. Gordon Brown for the Union-Castle Mail S.S. Co. 1914 (20th) edition. London: S. Low & Co., [1913]. Size 7½ × 5, pp. liv. and 695. *Map and Plans. Presented by the Union Castle Mail S.S. Co.*

Sudan—Language. **Haywood.**

English-Hausa vocabulary of words in every-day use. By Captain A. H. W. Haywood. 2nd edit. London: K. Paul & Co., 1914. Size 6½ × 4, pp. 31. *Price* 2*s. net. Presented by the Publishers.*

Transvaal—Survey. **Mines Department.**

Union of South Africa, Mines Department. Report of the Geological Survey (Transvaal) for the year 1911. Pretoria, 1912. Size 11 × 8½, pp. 114. *Maps, Sections, and Illustrations. Presented by the Mines Department.*

Tripoli—Sponge fishery. *R. Com. Talassogr. Italiano, Mem.* **18** (1912): pp. 154. **Sella.**

La pesca della spugne nella Libia. Per il dott. M. Sella. *Maps and Illustrations.*

Uganda. **Kmunke.**

Rudolf Kmunke. Quer durch Uganda: eine Forschungsreise in Zentralafrika 1911–1912. Berlin: D. Reimer, 1913. Size 10 × 7, pp. xiii. and 186. *Maps and Illustrations. Price M.*16. *Presented by the Publisher.*

Uganda—Handbook. **Wallis.**

The handbook of Uganda. Compiled by H. R. Wallis. London: Crown Agents for the Colonies, 1913. Size 9 × 5½, pp. xix. and 220. *Sketch-map and Illustrations. Price* 2*s.* 6*d. net. Presented for the Government of Uganda.*

West Africa. *B.S.G. Lille* **59** (1913): 257–275. **Gironcourt.**

De l'Ardrar au Cameroun. Par G. de Gironcourt. *Sketch-map and Illustrations.*

West Africa—Ethnology. **Tessmann.**

Die Pangwe: völkerkundliche Monographie eines westafrikanischen Negerstammes. Ergebnisse der Lübecker Pangwe-Expedition 1907–1909 und früherer Forschungen 1904–1907. Von Günter Tessmann. 2. Band. Berlin: E. Wasmuth, 1913. Size 11½ × 8, pp. 402. *Illustrations. Price* 13*s.* 6*d.*

The first volume appeared earlier in the year. The whole forms a detailed account of the Pangwe or Fan, their habits and customs.

Zululand—Language. **O'Neil.**

A grammar of the Sindebele dialect of Zulu, with numerous examples and a key to the exercises. By Rev. J. O'Neil. Bulawayo (London: Simpkin & Co.), [1913]. Size 7½ × 5, pp. xii. and 177. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

NORTH AMERICA.

Mexico—Cotton. *Minist. Col., Rapp. e Monogr. Col.* (1913): No. 5, pp. 51. **Aliotti.**

Il "dry farming" e la coltura del cotone nella Laguna di Torreon e di Tlahualilo (Stati di Coahuila e Durando) al Messico. Rapporto del Barone Carlo Aliotti. *Diagrams and Illustrations.*

Mexico—Fauna. *Ann. Assoc. American Geographers* **2** (1912): 41–48. **Ruthven.**

The local distribution of the reptile-amphibian fauna in Southern Vera Cruz and its bearing on the origin of the savannahs. By Alexander G. Ruthven. *Illustrations.*

Mexico—Gravity observations. *B.S. Mexicana G.* V. **6** (1913): 221–226. **Leon.**

La intensidad de la gravedad en Mexico. Por el Prof. Luis G. Leon.

North America—Earth-movements. *American J. Sc.* **35** (1913): 561–573. **Spencer.**

Relationship between terrestrial gravity and observed earth-movements of Eastern America. By J. W. Spencer. *Sketch-map.*

North America—Historical. **Salembier.**

Pierre d'Ailly et la découverte de l'Amérique. Par Louis Salembier. Extrait de da *Revue d'Histoire de l'Eglise de France*, September—December, 1912.) Paris, 1912. Size 10 × 6½, pp. 56.

United States—Arizona. *J.G.* **11** (1913): 277–284. **Barrows.**

Roosevelt dam and the Salt River valley. By Harlan H. Barrows. *Sketch-map, Diagram, and Illustrations.*

United States—California—Phytogeography. **Bowman.**

B. American G.S. **45** (1913): 13–16.

The dwarf forests of Southern California. By Isaiah Bowman. *Sketch-map and Diagram.*

United States.—Eastern States. **Johnson.**

Highways and byways from the St. Lawrence to Virginia. By Clifton Johnson. New York (London: Macmillan & Co.), 1913. Size 8 × 5, pp. xii. and 340. *Illustrations. Price 6s. 6d. net. Presented by the Publishers.*

United States—Ethnology. **Bureau of American Ethnology.**

Twenty-eighth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution. 1906–07. Washington, 1912. Size 12 × 7½, pp. 290 and xxxvi. *Map, Plans, and Illustrations.*

Contains papers on Casa Grande, Arizona, by J. W. Fewkes, and on the linguistic classification of the Algonquin tribes by Truman Michelson.

United States—Fishing-banks. *B. American G.S.* **45** (1913): 413–422. **Curtis.**

The fishing-banks off our Atlantic coast. By George Carroll Curtis. *Sketch-maps.*

See note in the Monthly Record, vol. **42**, p. 495.

United States—Historical **Washington and Hulbert.**

Washington and the west; being George Washington's Diary of September, 1784. Kept during his journey into the Ohio Basin in the interest of a commercial union between the Great Lakes and the Potomac River. And a commentary upon the same by Archer Butler Hulbert. Cleveland: A. H. Clarke Co., 1911. Size 8½ × 5½, pp. vii. and 217. *Facsimile maps, Plan, and Illustration. Price* $2.

United States—New Mexico. **Hewett and others.**

Smithsonian Institution. Bureau of American Ethnology, *Bulletin* 54. The physiography of the Rio Grande Valley, New Mexico, in relation to Pueblo culture. By Edgar Lee Hewett, Junius Henderson, and Wilfred William Robbins. Washington, 1912. Size 9½ × 6, pp. 76. *Sketch-map, Diagrams, and Illustrations.*

United States—New York. *B.G.S. Philadelphia* **11** (1913): 183–198. **Roorbach.**

The fault-block topography of the Mohawk valley. By G. B. Roorbach. *Sketch-map, Sections, and Illustrations.*

United States—Ohio river. *B. American G.S.* **45** (1913): 500–509. **Brown.**

The Ohio river floods of 1913. By Robert M. Brown. *Sketch-maps.*

United States—Seismology. *B. Seismological S. America* **3** (1913): 57–71. **Sampson.**

The New Madrid and other earthquakes of Missouri. By F. A. Sampson.

United States—Wisconsin—Industries. **Whitbeck.**

Ann. Assoc. American Geographers **2** (1912): 55–64.

Industries of Wisconsin and their geographic basis. By R. H. Whitbeck. *Sketch-maps.*

CENTRAL AND SOUTH AMERICA.

Bolivia—La Paz—Geology. *American J. Sc.* **36** (1913): 141–150. **Gregory.**

The La Paz (Bolivia) Gorge. By Herbert E. Gregory. *Illustrations and Sections.*

Brazil—Araguaya. *Z. Ethnologie* **44** (1912): 36–59. **Kissenberth.**

Ueber die hauptsächlichsten Ergebnisse der Araguaya-Reise. Von Dr. Wilhelm Kissenberth. *Sketch-maps and Illustrations.*

Brazil—Ceara. *Rev. Trim. I. Ceará* **26** (1912): 280–290. **Crandall and others.**

Lista de elevações, determinadas com o barometro aneroide, de alguns pontos do itinerario de Roderic Crandall, no Estado do Ceará. Itinerario de Guilherme Lane y Francisco Boa Nova.

Brazil—Early cartography. *Rev. Trim. Ceará* **26** (1912): 47–60. **Hafkemeyer.**

A Costa septentrional do Brazil na cartographia dos primeiros lustros do seculo 16. Por J. B. Hafkemeyer.

Brazil—Matto Grosso. *Z. Ethnologie* **44** 1912: 130–174. **Schmidt.**

Reisen in Matto Grosso im Jahre 1910. Von Max Schmidt. *Sketch-maps and Illustrations.*

This journey was referred to in vol. **39**, p. 401.

Brazil—Ports. **Gonçalves.**

Ministero da Viação e obras Publicas. Portos do Brazil. Leis, decretos, contractos e mais actos officiaes sobre os portos do Brazil, com annotações e noticia resumida dos estudos, projectos, concessões, obras de melhoramento nelles executados de 1901 a 1911. Supplemento ao relatorio do Dr. José Barboza Gonçalves. Rio de Janeiro, 1912. Size 9 × 6, pp. 592.

Central America—Commercial. ———

The future of Tropical America. All roads lead to the Panama Canal. Published by the Tropical Exploration Syndicate, Ltd. London, [1913]. Size 10½ × 8, pp. 92. *Maps and Illustrations.*

Chile—Nitrate. *B.S.R.G. Anvers* **36** (1912): 239–284. **Verbruggen.**

Le Nitrate de Soude du Chili. Par A. Verbruggen. *Sketch-map.*

Dutch Guiana—Paramaribo. *Ts. K. Ned. Aardr. Genoots.* **30** (1913): 236–238. **Sachse.**

De lengte van Paramaribo. Door P. W. Sachse.

See note in vol. **41**, p. 590.

Panama. *B.S. Belge Etudes Colon.* **20** (1913): 417–466. **Streitberg.**

La république de Panama. Par Th. Streitberg. *Map, Portrait, and Illustrations.*

Panama Canal. *J.R. Statistical S.* **76** (1913): 359–395. **Hutchinson.**

The Panama Canal and competition for trade in Latin America, the Orient, and Australasia. By Prof. Lincoln Hutchinson.

See note in the August number, 1913, p. 203.

Patagonia—Place-names. **Groussac.**

Toponymie historique des côtes de la Patagonie. Par Paul Groussac. (Extrait des *Anales de la Biblioteca* 1910.) Buenos Aires, 1913. Size 11 × 7½, pp. 44. *Map.*

Peru—Archæology. **Bingham.**

The discovery of Machu Picchu. By Dr. Hiram Bingham. (Reprinted from *Harper's Magazine*, April, 1913.) [New York, 1913.] Size 9½ × 6, pp. 709–720. *Plan and Illustrations.*

Peru—Cuzco—Archæology. **Bingham and others.**

The investigation of the prehistoric human remains found near Cuzco, Peru, in 1911. By Hiram Bingham. Vertebrate remains in the Cuzco gravels. By George F. Eaton. The gravels at Cuzco, Peru. By Herbert E. Gregory. (From the *American Journal of Science*, vol. **36**, July, 1913.) [New Haven, Conn., 1913.] Size 9 × 6, pp. 30. *Sketch-map, Illustrations, Sections, and Diagram.*

Titicaca island. *B. American G.S.* **45** (1913): 561–575. **Gregory.**

A geographical sketch of Titicaca, the island of the Sun. By Herbert E. Gregory. *Sketch-map and Illustrations.*

Uruguay—Meteorology. **Morandi.**

Instituto Nacional Fisico-Climatologico. Diez años de observaciones meteorologicas in el Observatorio del Prado. Por el Prof. Luis Morandi. Montevideo, 1911. Size 9½ × 6½, pp. 31. *Sketch-maps, Diagrams, and Illustrations.*

Venezuela. **Comision Exploradora.**

Informe de la Comision Cientifica Exploradora del Oriente de Venezuela. (From the *Revista Tecnica del Ministerio de Obras Publicas*, No. 20; Caracas, Agosto de 1912.) Size 12½ × 9½, pp. 400–406. *Maps.*

Venezuela—Andes. **Jahn.**

La Cordillera Venezolana de los Andes. Por Alfredo Jahn. (Publicación de la *Revista Tecnica del Ministerio de Obras Publicas*, Venezuela.) Caracas, 1912. Size 12½ × 9, pp. 40. *Map and Illustrations.*

Venezuela—Standard Time. **Ministerio de Obras Publicas.**

La hora legal en Venezuela. (*Revista Tecnica del Ministerio de Obras Publicas*, Núm. 26; Caracas, Febrero de 1913.) Size 12½ × 9½, pp. 73–75.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—History. **Fitchett.**

The New World of the South. [Vol. 2.] The romance of Australian history. By Dr. W. H. Fitchett. London: Smith, Elder & Co., 1913. Size 8 × 5, pp. viii. and 428. *Illustration. Price* 6*s. Presented by the Publishers.*

New Guinea, Dutch—Ethnology. **Nouhuys.**

Nova Guinea . . . sous les auspices de Dr. H. A. Lorentz. Vol. 7 (1913): Ethnographie:—

Pp. 1–33. Der Bergstamm Pĕsĕgĕm in Innern von Niederländisch-Neu-Guinea. Von J. W. van Nouhuys. *Maps and Illustrations.*

New Guinea—Papua—Mekeo. *B.S.G. Italiana* **2** (1912): 831–850. **Egidi.**

La vita dei Mekeo nella Nuova Guinea. Del V. M. Egidi.

New Guinea—Papua—Minerals. **Carne.**

Territory of Papua, B. No. 1 (1913): pp. viii. and 116.

Notes on the occurrence of coal, petroleum, and copper in Papua. By J. E. Carne. *Sketch-map, Plans, Sections, and Illustrations.*

New South Wales—Botany bay—Geology. **Andrews.**

J. and P.R.S. New South Wales **46** (1912): 158–185.

Beach formations at Botany bay. By E. C. Andrews. *Sections and Sketch-map.*

New Zealand—Canterbury. **Speight.**

T. and P. New Zealand I. **45**, 1912 (1913): 335–341.

Redcliff gully, Rakaia river. By R. Speight. *Sketch-map and Sections.*

New Zealand—Erosion. **Marshall.**

T. and P. New Zealand I. **45**, 1912 (1913): 342–345.

Note on the rate of erosion of the Hooker and Mueller glaciers. By Dr. P. Marshall.

New Zealand—Marlborough—Geology. **Cotton.**

T. and P. New Zealand I. **45**, 1912 (1913): 316–322.

The Tuamarina valley: A note on the quaternary history of the Marlborough Sounds District. By C. A. Cotton. *Sketch-maps, Illustrations, and Sections.*

Norfolk Island. *T. and P. New Zealand I.* **45**, 1912 (1913): 323–326. **Laing.**

Notes on the chief physiographic features of Norfolk Island. By R. M. Laing. *Sketch-maps.*

Pacific—Cook Islands. *J. Polynesian S.* **22** (1913): 67–76. **Large.**

Some notes on Atiu Island, Cook Group, South Pacific. By Major J. T. Large.

Victoria—Port Phillip—Historical. *Victorian G.J.* **29** (1912–13): 20–32. **Fowler.**

The work of Captain Matthew Flinders in Port Phillip. By Thomas Walker Fowler. *Charts.*

Victoria and New South Wales—Boundary. **Ogier.**

Victorian G.J. **29** (1912–13): 49–85.

The Riverina. By J. C. H. Ogier.

An historical summary of the boundary question.

Wallis Islands. *Rev. Française* **38** (1913): 417–420. ——

L'annexion des Iles Wallis. Par C. R.

These islands, previously under French protection, were formally annexed to France on June 12, 1913.

POLAR REGIONS.

Arctic—Life-conditions. *B. American G.S.* **45** (1913): 17–32. **Stefánsson.**

Misconceptions about life in the Arctic. By Vilhjálmur Stefánsson.

Arctic North America. **Stefánnson.**

My life with the Eskimo. By Vilhjálmur Stefánnson. London: Macmillan & Co., 1913. Size 9½ × 6, pp. x. and 538. *Maps and Illustrations. Price* 17*s. net. Presented by the Publishers.*

Arctic Ocean—Ice. **Speerschneider.**

Nautical-Met. Ann. (Denmark), 1912 (1913): vii.–xxv.

The state of the ice in the Arctic seas, 1912. Prepared by Comm. C. I. Hansen Speerschneider. *Charts.* [In English and Danish.]

See Monthly Record, *ante*.

Greenland. **Quervain.**

Quer durchs Grönlandeis: die schweizerische Grönland-Expedition 1912–13. Von Dr. Alfred de Quervain. Munich: E. Reinhardt, 1914. Size 9 × 6, pp. viii. and 196. *Sketch-maps and Illustrations. Price M.5. Presented by the Publishers.*

Greenland. *G. Ts., K. Danske G.S.* **22** (1913): 15–26. **Birket-Smith.**

Skærgaardsfarter i Sydgrønland. Fra den zoologiske Ekspedition til Julianehaabs og Frederikshaabs Distrikter 1912. Af Kaj Birket-Smith. *Sketch-map and Illustrations.*

Spitsbergen. **Isachsen.**

Skrifter Vidensk. S. Kristiania I. Kl., 1912 (1913): No. 15, pp. 100.

Rapport sur l'Expédition Isachsen au Spitsberg, 1909–1910. Par Gunnar Isachsen. *Map and Illustrations.*

Spitsbergen. **Vegard.**

Skrifter Vidensk. S. Kristiania I. Kl., 1912 (1913): No. 3, pp. 8.

L'influence du sol sur la glaciation au Spitsberg. Par L. Vegard.

Experiments are said to have shown that the unequal distribution of glaciation in Spitsbergen is *not* due to differences of the rocks.

Spitsbergen—Coasts. **Isachsen.**

Skrifter Vidensk. S. Kristiania I. Kl., 1912 (1913): No. 14, pp. 36.

The hydrographic observations of the Isachsen Spitsbergen Expedition, 1909–1910. By Gunnar Isachsen. *Maps and Illustrations.*

The charts give the results of surveys of various inlets, etc., with soundings.

Spitsbergen—Geology. **Holtedahl.**

Skrifter Vidensk. S. Kristiania, I. Kl., 1911 (1912): No. 10, pp. 46; 1912 (1913): No. 23, pp. 91.

Zur Kenntnis der Karbonablagerungen des westlichen Spitzbergens. Von Olaf Holtedahl. *Maps, Illustrations, and Sections.*

MATHEMATICAL GEOGRAPHY.

Cartography. **Cahill.**

A land map of the world on a new projection. By B. J. S. Cahill. (From the *Journal of the Association of Engineering Societies*, vol. 51, October, 1913.) Boston, 1913. Size 9½ × 6, pp. 153–207. *Maps and Diagrams.*

See note in the Monthly Record, January, 1914, p. 86.

Determination of Heights. *C.R.A. Sc. Paris* **156** (1913): 2031–2033. **Berget.**

Formule barométrique simplifiée pour la mesure des altitudes. Par Alphonse Berget.

Geodesy—Historical. *J. Asiatique* (Ser. II.) **1** (1913): 669–673. **Decouvdemanche.**

Note sur l'estimation de la longueur du degré terrestre par les Babyloniens. Par J. A. Decouvdemanche.

Longitude determination. **Renaud and Bourgeois.**

C.R.A. Sc. Paris **157** (1913): 165–171.

Résultats obtenus par la mission française chargée de l'exécution des opérations préliminaires relatives à la mesure de la différence de longitude par T. S. F. entre Paris et Washington, faites sous la haute direction de MM. Renaud et Bourgeois.

Photographic Survey. *Ymer: Ts. Svenska S.G.* **33** (1913): 47–70. **Byström.**

Fotogrammetrisk kartläggning. Af H. Byström. *Maps and Illustrations.*

Position-fixing. *Cairo Sc. J.* **7** (1913): 163–170. **Bennett.**

Notes on resection. By T. L. Bennett. *Diagrams.*

Survey. **Adams.**

Practical survey and elementary geodesy; including land surveying, levelling, contouring, compass traversing, theodolite work, town surveying, engineering field work, and setting out railway curves, with notes on plane-tabling, astronomical

surveying and heliographing. By Henry Adams. London: Macmillan & Co., 1913. Size 7½ × 5, pp. xii. and 276. *Illustrations and Diagrams.* *Price* 4*s.* 6*d.* *Presented by the Publishers.*

Survey Manual. **Bowie.**

Department of Commerce. U.S. Coast and Geodetic Survey. Astronomy. Special publication, No. 14. Determination of time, longitude, latitude, and azimuth. 5th edit. By William Bowie. Washington, 1913. Size 11½ × 9, pp. 178. *Illustrations and Diagrams.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Atlantis. *Ann. G.* **22** (1913): 209–226. **Germain.**

Le problème de l'Atlantide et la zoologie. Par Louis Germain.

Climatology. *Smithsonian Misc. Coll.* **60** (1913); No. 29, pp. 24. **Abbot and Fowle.**

Volcanoes and climate. By C. G. Abbot and F. E. Fowle. *Diagrams.*

Noticed in vol. **42**, p. 83.

Dunes. *B. American G.S.* **45** (1913): 513–515. **Haltenberger.**

On a genetic system of sand dunes, including two new types. By Dr. Michael Haltenberger. *Illustrations.*

Geology. *Univ. California Publ., B. Geology* **7** (1913): 325–334. **Lawson.**

The petrographic designation of alluvial fan formations. By Andrew C. Lawson.

Geomorphology—Mountains. *Geol. Mag.* V. **10** (1913): 385–388. **Burrard.**

The origin of mountains. By Colonel S. G. Burrard.

Geomorphology—Mountains. **Geikie.**

Mountains: their origin, growth, and decay. By Dr. James Geikie. Edinburgh: Oliver & Boyd, 1913. Size 9 × 5½, pp. xix. and 311. *Sketch-map, Sections, and Illustrations.* *Price* 12*s.* 6*d.* *net.* *Presented by the Publishers.*

Geomorphology—Peninsula. *La G., I.G. De Agostini* **1** (1912–13): 365–375. **Azzi.**

Che cosa si debba intendere per peninsola. Dell dott. Girolamo Azzi. *Sketch-maps.*

Glaciers. *C.R.A. Sc. Paris* **156** (1913): 1948–1950. **Vallot.**

La vitesse des glaciers en hiver et l'inanité de la théorie thermique de leur progression. Par J. Vallot.

Glaciers and Climate. **Monti.**

Atti R.A. Lincei, Ser. V., Rendiconti A., Sc. fis. **22** (1913): 1 Sem., 690–696.

Sull' azione refrigeratrice dei ghiacciai. Del Prof. V. Monti.

Land and Water. *Ann. I. Océanogr. Paris* **5** (1913): No. 10, pp. 12. **Berget.**

La répartition géographique des océans et la détermination du pôle continental. Par Alphonse Berget. *Sketch-maps.*

See note on the writer's preliminary communication, October number, p. 404.

Mineral Waters. *La G., B.S.G. Paris* **28** (1913): 35–41. **Fleury.**

Contribution à la connaissance de la nature des eaux minérales. Par Ernest Fleury.

Ocean Floor. *Ann. I. Océanogr. Paris* **5** (1913): No. 9, pp. 14. **Thoulet.**

Notes de lithologie sous-marine. Par J. Thoulet.

Oceanography. **Murray.**

The ocean: a general account of the science of the sea. By Sir John Murray. London: Williams & Norgate, [1913]. Size 7 × 4½, pp. 256. *Maps and Illustrations.* *Price* 1*s.* *net.* *Presented by the Publishers.*

Oceanography—Adriatic. *B.R. Com. Talassogr. Italiano*, 1912: 295–317. **Feruglio.**

Primi risultati di esperienze con gallegianti per lo studio delle correnti del mare Adriatico. Per il dott. Giuseppe Feruglio. *Map.*

Oceanography—Barents Sea. **Van der Veen.**

Ts. K. Ned. Aardr. Genoots. **30** (1913): 207–211.

Barents-Zee: iets over zeezand en grondstroomingen. Door Dr. A. L. W. F. van der Veen. *Sketch-map.*

Oceanography—Fish. *R. Com. Talassogr. Italiano, Mem.* **19** (1913): pp. 42. **Grassi.**
La talassobiologia e la pesca. Per il prof. Battista Grassi.

Oceanography—Greenland Sea. **Trolle.**
Danmark ekspeditionen til Grønlands Nordøstkyst 1906–1908. Band I. Nr. 2. Hydrographical observations from the Danmark expedition. By Alf Trolle. (Extract from *Meddelelser om Grønland*, **41**.) Copenhagen, 1913. Size 11 × 7, pp. 275–426. *Charts, Diagrams, and Illustrations.*

Oceanography—Instrument. **Feruglio.**
R. Com. Talassogr. Italiana, Mem. **7** (1912): pp. 33.
Il termometro a rovesciamento Richter e tavole per la sua correzione. Per il dott. Giuseppe Feruglio.

Oceanography—Mediterranean. **Dainelli and others.**
Mem. G., Riv. G., Italiana, 1913: 193–241.
Materiali per la conoscenza del Mediterreneo. IV.: Esperienze sulle correnti nel Tirreno. Ricerche di G. Dainelli, O. Marinelli e G. Stefani. *Maps.*

Oceanography—North Atlantic. **Danish Meteorological Institute.**
Nautical-Met. Ann. (Denmark), 1912 (1913): 12 *Charts.*
The surface temperature of the sea in the northern Atlantic Ocean and in Davis Strait, 1912. *Charts (only).*

Oceanography—North Sea and Baltic. **Hansen-Ostenfeld.**
De danske farvandes Plankton, Aarene 1898–1901. Phytoplankton og Protozoer, I. Af Carl Hansen-Ostenfeld. [From *K. Danske Vid. Selsk. Skrifter, 7 Række, Naturv. og Math. Afd.*, IX. 2.] Copenhagen, 1913. Size 10½ × 8½, pp. 364. *Illustrations.* [*Résumé* in French.]

Oceanography—Sea-water. *P. American A.* **48** (1913): 671–678. **Mark.**
Preliminary study of the salinity of sea-water in the Bermudas. By Kenneth S. Mark. *Sketch-maps.*

Physical Geography. **Martonne.**
Emm. de Martonne. Traité de géographie physique: climat; hydrographie; relief du sol; biogéographie. 2e édit. Paris: A. Colin, 1913. Size 10 × 6½, pp. xii. and 924. *Maps, Diagrams, and Illustrations. Price 22 fr. Presented by the Publisher.*

Seismology. *B. Seismological S. America* **3** (1913): 51–56. **Sayles.**
Earthquakes and rainfall. By R. W. Sayles. *Diagram.*

Seismology—Map. *Ann. Assoc. American Geographers* **2** (1912): 49–54. **Joerg.**
On the proper map for determining the location of earthquakes. By Wolfgang L. G. Joerg. *Sketch-map.*

Zoogeography—Camel. *Smithsonian Misc. Coll.* **60** (1913): No. 26, pp. 2. **Gidley.**
Notice of the occurrence of a pleistocene camel north of the Arctic Circle. By James Williams Gidley.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Ships. **Society for Nautical Research.**
The Mariner's Mirror; wherein may be discovered his art, craft, and mystery after the manner of their use in all ages and among all nations. The Journal of the Society for Nautical Research, vols. 1 and 2, 1911–1912. London, 1911–12. Size 9½ × 6½. *Illustrations.*

Anthropogeography—Towns. **Haverfield.**
Ancient town-planning. By F. Haverfield. Oxford: Clarendon Press, 1913. Size 9 × 6, pp. 152. *Plans and Illustrations. Price 6s. net. Presented by the Publishers.*

Commercial—Ports. *La G., B.S.G. Paris* **27** (1913): 262–276. **Assada.**
Les types de ports. Essai de classification. Par I. Assada.

Economic—Power-resources. **Gibson.**
Natural sources of energy. By Dr. A. H. Gibson. Cambridge: University Press, 1913. Size 6½ × 4½, pp. viii and 138. *Maps, Illustrations, and Diagams. Price 1s. net. Presented by the Publishers.*

Historical geography. **Besnier.**

Lexique de géographie ancienne. Par Maurice Besnier. Paris: C. Klincksieck, 1914. Size 7 × 4½, pp. xx. and 893. *Price* 10 *fr. Presented by the Publishers.*

History of Exploration. **Williamson.**

Maritime enterprise, 1485–1558. By James A. Williamson. Oxford: Clarendon Press, 1913. Size 9½ × 6, pp. 416. *Sketch-maps, Facsimile plan, and Illustrations. Price* 14*s. net. Presented by the Publishers.*

History of Navigation. **Ruiters, Brun, and Naber.**

Toortse der zee-vaert, door Dierick Ruiters (1623). Samuel Brun's schiffahrten (1624). Uitgegeven door S. P. l'Honoré Naber. (Werken uitgegeven door de Linschoten-Vereeniging, 6.) The Hague: M. Nijhoff, 1913. Size 10 × 6½, pp. lii., 94, and 112. *Map.*

Norse Voyages. **Thalbitzer.**

Four Skraeling words from Markland (Newfoundland) in the saga of Erik the Red (Eirikr Rauzi). By William Thalbitzer. (Reprinted from the *Proceedings* of the XVIIIth International Congress of Americanists.) London, [1913]. Size 11 × 7½, p. 10.

BIOGRAPHY.

Biography. **Stephenson.**

Who's Who in Science: International, 1914. Edited by H. H. Stephenson. London: J. & A. Churchill, [1913]. Size 9 × 6, pp. xx. and 662. *Portraits. Price* 10*s. net. Presented by the Publishers.*

Broussonet. *La G., B.S.G. Paris* **28** (1913): 113–118. **Froidevaux.**

Un voyageur oublié: Auguste Broussonet. Par Henri Froidevaux.

This French naturalist visited Morocco and the Canaries between 1795 and 1803.

Columbus. **Vignaud.**

Les Thèses nouvelles sur l'origine de Christophe Colomb: Espagnol! Juif! Corse! Par Henry Vignaud. (Extrait du No. 18 de la *Revue Critique d'Histoire et de Littérature.*) Paris, 1913. Size 10 × 6½, pp. 20.

See note in Monthly Record, *ante.*

Columbus. **Horta y Pardo.**

La verdadera Cuna de Cristóbal Colón. Por el Dr. Constantino de Horta y Pardo. New York, 1912. Size 7 × 5, pp. 96. *Portraits and Illustrations.*

Attempts to show that the place of origin of Columbus was Pontevedra in Galicia, where a family of the name Colon is shown by documentary evidence to have been settled in the fifteenth century. All evidence to the contrary is disregarded (see Monthly Record, *ante*).

Hugues. *B.S.G. Italiana* **2** (1913): 430–439. **Ricchieri.**

Luigi Hugues. Dal Prof. Giuseppe Ricchieri.

Juan [and Ulloa]. **Ortíz.**

[Biografía de D. Jorge Juan, por Eduardo León y Ortíz.] (From *Revista de la Sociedad Matemática Española*, Año 2, Diciembre, 1912). Madrid, 1913.) Size 10 × 6½, pp. 67–116. *Portraits and Illustration.*

One section deals with the voyage of Juan and Ulloa to South America to co-operate in the degree measurement in the eighteenth century.

Ridgeway. **Quiggin.**

Essays and studies presented to William Ridgeway on his sixtieth birthday, August 6, 1913. Edited by E. C. Quiggin. Cambridge: University Press, 1913. Size 9½ × 6½, pp. xx. and 656. *Sketch-maps, Plans, and Illustrations. Price* 25*s. net. Presented by the Publishers.*

Those of the studies which concern geography will be entered separately.

Zubeir Pasha. **Jackson.**

Black ivory and white; or the story of El Zubeir Pasha, slaver and sultan, as told by himself. Translated and put on record by H. C. Jackson. Oxford: B. H. Blackwell, 1913. Size 7½ × 5, pp. iv. and 118. *Price* 2*s.* 6*d. net. Presented by the Publisher.*

GENERAL.

Educational—Place-names. *Scottish G. Mag.* **29** (1913) : 429–422. **Ramsay.**
The use of place-names in the teaching of geography. By James A. Ramsay.

Educational. *G. Teacher* **7** (1913) : 19–28. **Fawcett.**
On the teaching of the cycle of land forms. By C. B. Fawcett.

Educational. *G. Teacher* **7** (1913) : 4–19. **Mackinder.**
The teaching of geography and history as a combined subject. By H. J. Mackinder.

Explorations. **Smithsonian Institution.**
Smithsonian Misc. Coll. **60** (1913) : No. 30, pp. 76.
Explorations and field-work of the Smithsonian Institution in 1912. *Illustrations.*

Geographical Excursion. *Ann. Assoc. American Geographers* **2** (1912) : 73–100. **Davis.**
A geographical pilgrimage from Ireland to Italy. By (Prof.) W. M. Davis. *Sections.*

Geography in Italy. **Ricchieri.**
Prof. G. Ricchieri. Il contributo degli Italiani alla conoscenza della Terra ed agli studi geografici nell' ultimo cinquantenio. Rome, 1912. Size 10½ × 7½, pp. 28.

Italian Colonies—Population. **Guidi.**
Minist. Col. (Italia) ; *Rapporti e Monografie Col.* (1913) : No. 10, pp. 14.
Le popolazioni delle Colonie Italiane. Del Ignazio Guidi.

Photography—Diary. ——
The Wellcome Photographic Exposure Record and Diary, 1913. London : Burroughs, Wellcome & Co. Size 5½ × 3, pp. 280. *Illustrations. Presented by the Publishers.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**
Artaria's Eisenbahnkarte von Österreich-Ungarn und den Balkanländern. Mit 8 Nebenkarten und Plänen und vollständigem Stationsverzeichnis. V. Neubearbeitung, 4. Auflage, 1914. Size 31 by 44 inches. Vienna : Artaria & Co., 1914. *Price* 2.40 *Kr. Presented by the Publishers.*

Austria-Hungary. **K. u. K. Militärgeographisches Institut.**
Spezialkarte der österreichisch-ungarischen Monarchie und anschliessender Gebiete. Scale 1 : 75,000 or 1 inch to 1·2 stat. miles. Sheets : Zone 17 Kol. II., Stuben ; Zone 17 Kol. VI., Hippach und Wildgerlos-Spitze ; Zone 18 Kol. III., Nauders ; Zone 18 Kol. IV., Sölden und St. Leonhard. Size 17 by 22 inches. New editions. Vienna : K. u. K. Militärgeographisches Institut, 1912–13.

British Isles—England and Wales. **Ordnance Survey.**
Sheets published by the Director-General of the Ordnance Survey, from December 1 to 31, 1913.

1-inch map :—

Large-sheet series, printed in colours, and folded in covers or flat in sheets. Sheets 29, 30, 34, 35, 36. *Price, flat paper,* 1*s.* 6*d. ; mounted on linen,* 2*s. ; mounted in sections,* 2*s.* 6*d.*

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4 miles to 1 inch, showing Civil Parishes, with Table of Areas. Kent. *Price* 6*d.*

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Revised quarter-sheets, with contours in blue or red. *Price* 1*s. each.*

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Messrs. E. Stanford, Ltd., London Agents.

Central Europe. **K. K. Militärgeographisches Institut.**

Generalkarte von Mitteleuropa. Scale 1 : 200,000 or 1 inch to 3·15 stat. miles. Sheets: 35°–44°, Travnik; 36°–47°, Székesfehérvár; 36°–48° Komárom; 37°–44°, Zvornik; 37°–45°, Mitrowitz; 37°–47°, Budapest Kecskemét; 38°–45°, Belgrad; 39°–45, Werschetz; 40°–45°, Orsova; 40°–46°, Lugos; 40°–47°, Groszwardein; 41°–46°, Gyula-Fehérvár (Karlsburg); 43°–46°, Brassó (Kronstadt); 43°–47°, Gyergyó-Szt.-Miklós. Size 24 by 17 inches. New editions. Vienna: K. K. Militärgeographisches Institut, 1913. *Price* 1.20 *M. each sheet.*

Central Europe. **K. Preuss. Landesaufnahme.**

Uebersichtskarte von Mitteleuropa. Herausgegeben von der Kartogr. Abteilung der Kgl. Landesaufnahme. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheets: Libau, Nürnberg, Slonin. Size 17 by 20 inches. Berlin: R. Eisenschmidt, 1913. *Price* 1.50 *M. each sheet.*

Scandinavia. **Roth.**

Norden. Av Dr. Magnus Roth. Scale 1 : 1,000,000 or 1 inch to 15·78 stat. miles. 8 sheets, each 19 by 28 inches. Stockholm: P. A. Norstedt & Sons, 1913.

A new edition of this useful general map of Norway, Sweden, and Denmark.

ASIA.

Federated Malay States. **Surveyor-General, F.M.S.**

Topographical Survey of the Federated Malay States. Scale 1 : 63,360 or 1 inch to 1 stat. mile. Sheets: 2 M–7, Parts of Matang, Kuala Kangsar, Larut districts, and Dindings territory; 2 M–11, Parts of Dindings territory, K. Kangsar, and Lower Perak districts; 2 M–15, Parts of Dindings territory and Lower Perak district. Size 18 by 19 inches. Kuala Lumpur: Surveyor-General's Office, 1912. *Price* $2.50 *each sheet. Presented by Colonel H. M. Jackson, Surveyor-General, Federated Malay States.*

These are three sheets of the new government survey of the Federated Malay States, of which particulars, with an index, will be found in the annual Colonial Survey Committee report. The work is being carried out by an efficient staff under the superintendence of Colonel H. M. Jackson, late R.E., and is making good progress, a considerable amount of the triangulation and topographical detail having already been completed in the field. The present are the first sheets to be published, and they include the west coast country from 4° to 4° 45′ N. lat., and each embraces fifteen minutes of latitude and fifteen minutes of longitude. Relief is shown by contours in brown at 50-feet intervals, while heights of definite points are given in figures, and the manner in which they have been determined indicated by a letter following the figures. By a very complete arrangement of symbols and conventional signs much detailed information is given as to the character of forests, swamps, plantations, mines, railways, roads, rest-houses, and other particulars.

India. **Survey of India.**

Maps published by the Survey of India during the quarter ending September 30, 1913. Miscellaneous maps: Panoramic profile of the hill ranges of Sikkim. Point of Sight Observatory Hill Station, Darjeeling; Punjab and North-West Frontier Province, scale 1 inch to 2 miles, sheet 43–G 1 and 2, and C 13 and 14.—District maps, scale 1 inch to 4 miles: Purnea.—India and adjacent countries, scale 1 : 1,000,000, sheets (provisional issue) 61, 72 (without hills).—Degree sheets,

scale 1 inch to 4 miles: Bengal, sheet 79–G; Bihar and Orissa, sheets (provisional issue) 72–D, 72–H; Bihar and Orissa and Bengal, sheets (provisional issue) 72–O, 73–I, 73–M; Bihar and Orissa and Madras, sheet (provisional issue) 73–D; Bihar and Orissa and United Provinces, sheet (provisional issue) 72–C; Bihar and Orissa, United Provinces and Central Provinces, sheet (provisional issue) 63–P; Nepal, sheet (provisional issue) 72–E; Nepal, Bengal and Bihar and Orissa, sheet (provisional issue) 78–B; Nepal and Bihar and Orissa, sheet (provisional issue) 72–N; Nepal, Bihar and Orissa and United Provinces, sheets (provisional issue) 63–M, 72–A.—Standard maps, scale 1 inch to 1 mile: Assam, sheets 78–N 3, 78–N 4, 78–N 6, 78–O 16; Berar and Hyderabad, sheets 56–E 1, 56–E 6; Bihar and Orissa, sheets (preliminary edition) 72–L 14, 72–L 16; Burma, sheets 92–D 7, 92–D 8, 92–D 14, 92–H 1, 93–A 2 and 6 (236), 93–E 1, 93–K 10 and 14 (507) (2nd edit.), 93–P 3 and 7 (568), 93–P 11, 94–B 3 and 7 (257) (preliminary edition), 94–E 1, 94–E 3, 94–E 4, 94–E 5, 94–E 6, 94–E 7, 94–M 1; Central Provinces, sheet 55–J 7; Kashmir and Jammu, sheets 43–F 15, 43–J 7, 43–K 9, 43–O 1; Madras, sheets 48–L 15, 58–A 11, 58–A 15, 58–B 3; Madras and Coorg, sheet 48–P 11; Madras and Mysore, sheets 48–K 14, 48–O 3, 48–O 8, 48–O 12; Punjab, sheets 43–D 16, 44–E 5, 44–E 6, 44–E 7, 44–I 4, 44–I 7, 44–I 11, 43–M 5, 44–M 7, 44–M 10, 44–M 11; United Provinces, sheets 53–L 10, 53–L 11, 53–L 15, 53–P 4, 53–P 7, 54–M 5, 54–M 10, 54–M 12, 54–M 16, 63–A 4, 63–A 9, 63–A 11, 63–A 13, 63–A 16, 63–E 5; United Provinces and Central India, sheet 54–O 8 (preliminary edition).—Standard maps, scale 1 inch to 4 miles: North-Eastern Frontier, sheet 83–J and N (14 S.E.) Calcutta: Map Record and Issue Office, 1913. *Presented by the Surveyor-General of India.*

AFRICA.

Africa. **Survey Dept., Khartoum.**

Africa. Scale 1: 1,000,000 or 1 inch to 15·78 stat. miles. Compiled from Sudan Survey Dept. Maps, Khartoum, 1910. Sheet North C–36, Sobat. Cairo: Egyptian Survey Department, 1912. Size 18 by 27 inches. *Presented by the Director of Surveys, Sudan Government, Khartoum.*

Cape of Good Hope. **Geographical Section, General Staff**

Africa. Scale 1: 250,000 or 1 inch to 3·9 stat. miles. Sheets: South H 35–Q, Mount Fletcher; South H 35–S, Naauwpoort. Size 18 by 16 inches. Drawn and printed at the Geographical Section, General Staff, War Office, 1913. London Agents: E. Stanford, Ltd.; Sifton, Praed & Co.; T. Fisher Unwin. *Price* 1*s.* 6*d. net each sheet. Presented by the Director of Military Operations.*

Egypt. **Egyptian Survey Dept.**

Topographical map of Egypt. Scale 1: 50,000 or 1·3 inch to 1 stat. mile. 2nd edit. Sheets: N.E., III.–iii., Zagazig; IV.–ii., Mît Ghamr; IV.–v., Qassasîn el Sharq; V.–ii., Simbellawein; V.–iii., Abu el Sheqûq; V.–v., El Managât; VI.–i., Biala; VI.–ii., Mansûra; VI.–iii., Dekernes; VI.–iv., Manzala; VI.–v., Matarîa; VII.–iv., Lake Manzala West; VIII.–iv., Damietta. S.W., IX.–i., Gebel el Teir; X.–i., Minia; XI.–ii., Balansura; XII.–ii., Dalga. Size 18 by 20 inches. Giza: Survey Department, 1913. *Presented by the Director-General, Egyptian Survey Department.*

Egypt. **Egyptian Survey Dept.**

Topographical map of Egypt. Scale 1: 10,000 or 6·3 inches to 1 stat. mile. Sheets: N.E., 12–9, 12–10, 13–6, 13–8, 13–9, 14–6, 14–8, 15–8, 15–9, 16–9, 16–10, 16–17, 17–11, Mudirîa Sharqia; N W., 26–11, 27–11, Mudirîa Beheira. Size 20 by 18 inches. Giza: Survey Department, 1913. *Presented by the Director-General, Egyptian Survey Department.*

German East Africa. **Meyer.**

Hans Meyer's Ostafrika-Expedition, 1911. Scale 1: 300,000 or 1 inch to 4·7 stat. miles. Blatt 1, Ihángiro und der Burigi-See. Blatt 2, Die Muwissi-Berge und das westliche Randgebirge von Ruanda und Urundi. Blatt 3, Süd-Ussagara. Size 16 by 14 inches. Übersichtskarte, mit Eintragung der Vegetationsformationen. Scale 1: 5,000,000 or 1 inch to 78·9 stat. miles. Size 11 by 10 inches. From *Mitteilungen aus den deutschen Schutzgebeiten, Erganzungsheft*, No. 6, 1913. Berlin: E. S. Mittler & Sohn, 1913. *Presented by Dietrich Reimer (Ernst Vohsen), Berlin.*

Maps of special districts as stated in the titles, with a small map of German East Africa, giving general information, distribution of vegetation, and the author's route in red. They accompany the scientific report of the expedition.

German South-West Africa. **Seiner.**

Die deutsche Zone des Okawango nach den Aufnahmen Franz Seiner's im Jahre 1911. Mit Benutzung aller vorhandenen Materialien bearbeitet von H. Nobiling und W. Rux unter Leitung von Paul Sprigade. Scale 1 : 100,000 or 1 inch to 1·6 stat. miles. 2 sheets, each 36 by 24 inches. From *Mitteilungen aus den deutschen Schutzgebieten*, Band XXVI., 1913. Maps 5 and 6.

Die Grauwackenzone des Okwango von Libebe bis Popa nach den Aufnahmen Franz Seiner's im Jahre 1911. Mit Benutzung aller vorhandenen Materialien bearbeitet von P. Just unter Leitung von Paul Sprigade. Scale 1 : 25,000 or 2·5 inches to 1 stat. mile. Size 15 by 28 inches. From *Mitteilungen aus den deutschen Schutzgebieten*, Band XXVI., 1913. Map 7.

Karte der Aufnahmen Franz Seiner's im Kungfeld und nördl. Sandfeld im Jahre 1912. Mit Benutzung aller vorhandenen Materialien bearbeitet unter Leitung von Paul Sprigade von H. Nobiling. Scale 1 : 500,000 or 1 inch to 7·8 stat. miles. Size 19 by 17 inches. From *Mitteilungen aus den deutschen Schutzgebieten*, Band XXVI., 1913. Map 8. Berlin : E. S. Mittler & Sohn, 1913. *Presented by Dietrich Reimer (Ernst Vohsen), Berlin.*

Nos. 5 and 6 form an important coloured map in six sections on two sheets, showing the course of the Okavango river from long. 17° 35′ to 21° 52′ E. A fair amount of detail as to breadth and character of streams, etc., is given, and along the banks there are notes on the vegetation and other information. No. 7 is a large-scale map of the Okavango between long. 11° 30′ and 11° 41′ E., and No. 8 is a general map showing Herr Franz Seiner's surveys in the region extending from 17° 50′ to 20° S. lat. and 18° 10′ and 20° 35′ E. long. The maps accompany a report on the scientific work of the expedition.

Kamerun. **Moisel.**

Karte von Kamerun, bearbeitet von M. Moisel. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheet E 1, Gajama. Size 8 by 9 inches. Berlin : Dietrich Reimer (Ernst Vohsen), 1913. *Presented by the Publishers.*

This small sheet, which includes a part of the Kamerun-Southern Nigeria boundary extends from 6° 30′ to 7° N. lat., and from 9° 45′ to 10° E. long. It is accompanied by a pamphlet giving a list of the authorities consulted and material utilized in its preparation and that of sheet E 2, Banjo which appeared a short time ago.

This excellent map is now complete. The first sheets were published in 1910, and noticed in the *Geographical Journal* for February, 1911. Like the corresponding map of German East Africa, it is a careful compilation of all existing route traverses, boundary surveys, and other available cartographical material, including that of the earlier travellers as well as those of recent date ; and it will, for a long time to come, doubtless be the best general map of the country, specially if it is carefully revised from time to time as new information is forthcoming.

South Africa. **"South Africa."**

The Railway Map of South Africa. Scale 1 : 4,752,000 or 1 inch to 75 stat. miles. Size 30 by 22 inches. Revised to date and published by authority at the offices of "South Africa," London, E.C., 1914.

South-West Africa. **Springade, Nobiling, and Groll.**

Karte des Deutsch-Portugiesischen Grenzgebiets in Südwestafrika. Bearbeitet unter Leitung von Paul Sprigade von H. Nobiling. Das portugiesische Gebiet auf Grundlage einer Bearbeitung von Dr. Max Groll. Scale 1 : 500,000 or 1 inch to 7·89 stat. miles. Sheet 2. Size 36 by 33 inches. From *Mitteilungen aus den deutschen Schutzgebieten*, Band XXVI., 1913, Karte 4. Berlin : G. S. Mittler & Sohn, 1913. *Presented by Dietrich Reimer (Ernst Vohsen), Berlin.*

The area included extends from 15° to 19° S. lat., and from 15° 30′ to 19° 20′ E. long. It forms the second sheet of an important coloured map of the German-Portuguese boundary region in South-West Africa. Considerable information is shown, including farms, location of minerals, military and telegraph stations, water, character of vegetation, and travellers' routes.

Togo. **Gruner.**

Karte des Sechsherrenstockes (bisher Kunjagebirge genannt). Nach den Aufnahmen des Regierungsrats Dr. H. Gruner unter Leitung von P. Sprigade bearbeitet und gezeichnet von H. Ketzer. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Size 24 by 16 inches. From *Mitteilungen aus den deutschen Schutzgebieten*, Band XVI.,

1913. Berlin: E. S. Mittler & Sohn, 1913. *Presented by Dietrich Reimer (Ernst Vohsen), Berlin.*

A map of a special district in Togo extending from about 7° 7′ to 7° 22′ N. lat. and 0° 19′ to 0° 30′ E. long. Relief is shown approximately by form lines in brown. An account of the survey is given in the text.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1:100,000 or 1 inch to 1·6 stat. miles. Sheets: LXXVI., Houmt Souk; XCIV., Bir el Metroha; CI., Ben Gardane. Paris: Service Géographique de l'Armée, 1913. Size 16 by 26 inches. *Price* 1.20 *fr. each sheet.*

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1:190,080 or 1 inch to 3 stat. miles. Sheets: 23, Emerson, Manitoba, revised to October 15, 1913; 72, Portage La Prairie, Manitoba, revised to October 17, 1913; 165, Rosebud, Alberta, revised to July 14, 1913; 216, Sullivan Lake, Alberta, revised to June 14, 1913; 363, Baptiste, Alberta, revised to September 3, 1913. Size 16 by 30 inches. Ottawa: Department of the Interior, Topographical Surveys Branch, 1913. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of Mines, Geological Survey.**

Geological Survey of Canada. Map 55 A, Geological Map of Alberta, Saskatchewan and Manitoba. Scale 1:2,217,600 or 1 inch to 35 stat. miles. Map 108 A, New Brunswick, carboniferous areas, and positions of certain shale and clay deposits. Scale 1: 1,267,200 or 1 inch to 20 stat. miles. Ottawa: Department of Mines, Geological Survey, 1913. *Presented by the Department of Mines, Geographical Survey, Ottawa.*

Peru. **Sociedad Geografica de Lima.**

El Peru en 1913. Trazado por la Sociedad Geografica de Lima y mandado publicar y distribuir gratuitamente en el XXV. Aniversario de su institucion por su socio fundador Exemo. Sr. Guillermo E. Billinghurst, Presidente de la Republica. Scale 1:3,000,000 or 1 inch to 47·3 stat. miles. Size 32 by 22 inches. Lima: Sociedad Geografica de Lima, 1913. *Presented by Sr. Eduardo Lembcke.*

A roughly produced general sketch-map, printed in colours.

AUSTRALASIA.

Western Australia. **Dept. of Lands and Surveys, Perth.**

Map of Western Australia. Scale 1:1,900,800 or 1 inch to 30 stat. miles. 2 sheets (south sheet contoured), each sheet 28 by 38 inches. Perth: Department of Lands and Surveys, 1913. *Presented by the Surveyor-General of Western Australia.*

A general map in two sheets, showing towns and railways, land district boundaries, land divisions, goldfields, telegraph lines and stations, stock routes, and other information. On the southern sheet an attempt has been made to indicate relief on the layer system, in different colours, but the result can only be very approximate owing to the lack of sufficient data. There is no regular gradation of tints, and the colours appear to have been chosen in a haphazard manner and upon no system whatever. The contour intervals in feet are: sea-level to 250, 250–500, 500–750, 750–1000, 1000–1250, 1250–1500, 1500–1750, 1750–2000, 2000 and above.

GENERAL.

World. **Hickmann.**

Prof. A. L. Hickmann's Geographisch-Statistischer Universal-Taschen Atlas. 66 Tafeln, 64 Seiten Text. Size 7 by 4 inches. Vienna and Leipzig: G. Freytag & Berndt, 1914. *Price* 4.50 *k. Presented by the Publishers.*

A new and revised edition of a little pocket-atlas giving a considerable amount of interesting and useful information in a very compact form, by graphic diagrams and figures. In some of the maps an attempt has been made to show the new arrangement of the Balkan States.

World. **Monaco.**

Carte générale bathymétrique des Océans. Publiée par le Cabinet Scientifique de

S.A.S. le Prince de Monaco. Scale 1 : 10,000,000 or 1 inch to 157·8 stat. miles. Sheets : A'III., A'IV., each 20 by 39 inches. Paris, 1913. *Presented by the Cabinet Scientifique de S.A.S. le Prince de Monaco.*

These two sheets extend from the equator to 46° 40′ S. lat., and from the meridian of Greenwich eastward to 180° long. They thus together include the eastern section of the South Atlantic, Africa south of the equator, the southern part of the Indian ocean, Australia, New Zealand, part of the Eastern Archipelago, and the Western Pacific. Heights of land and depths of water are shown on the layer system, the former in brown, and the latter in blue. Heights up to 1000 metres are at intervals of 0 to 200, 200 to 500, 500 to 1000, and after this the intervals are at 1000 metres. Exactly the same rule applies to the depths of water, which is important for the sake of comparison. Of the twenty-six sheets comprising the new edition of this map six are now published.

World. **Schrader.**

L'Année Cartographique. Supplément Annuel à toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Vingt-troisième Année 1912–1913. Paris : Hachette & Cie. 1913. *Price* 3 *fr. Presented by the Publishers.*

The twenty-third issue of this handy cartographical annual consists as usual of three double sheets of coloured maps and plans, with explanatory and descriptive text on the back. The first sheet deals with Europe and Asia, the second with Africa, and the third with America and the Polar Regions. From the following list of contents it will be seen that the more important geographical events of the year have received attention ; and the maps, though small, with the short description, give a good summary which will be useful to refer to for general purposes. The contents are as follows :—

Asia—Europe: Carte général. Voyages et délimitations, 1912–1913.—Indochine Méridionale. Explorations de M. H. Maitre.—Les Sources du Yenisei, le Karlyk-Tagh et les Monts du Barkoul. Voyages de D. Carruthers.—Le Yemen Méridional. Reconnaissances de A. Beneyton.—La Mésopotamie, d'après les levés du D. baron de Handel-Mazzetti et de Sir W. Willcocks.—Pays des Abors, d'après les levés de l'" Abor Expedition."—Péninsule des Balkans, modifications territorials, 1913.

Afrique.—Carte Générale. Voyages, délimitations, chemins de fer, 1912–1913.—Les Régions voisines de l'Adrar, d'après la carte du lieutenant G. Schmitt.—La Frontière Orientale de Sierra Leone, d'après les dernières conventions.—L'Aïr, d'après la carte du capitaine Cortier.—Région entre la Côte des Moçambique et les Monts Namouli, d'après les levés des Expéditions envoyées en 1910–11 par la Société " Memba Minerals Ltd."—La Région Frontière Anglo-Germano-Belges dans l'Afrique Orientale. Travaux de la Commission anglaise de délimitation (Capitaine E. M. Jack).

Amérique et Régions Polaires.—Carte Générale de l'Amérique. Exploration, 1912–1913.—Section de la Cordillère Argentine (Province de San Juan), d'après la carte de Fr. Kühn.—Le Canal de Panama d'après les derniers rapports de la " Isthmian Canal Commission."—Voyage dans la Cordillère Orientale de Bolivie. Levés du Dr. Th. Herzog.—Nouvelles Recherches dans les Régions Antarctiques, 1912–1913. Expéditions Scott, Mawson, Filchner, etc.—Amérique Boréale. Expéditions Einar Mikkelsen, Knud Rasmussen, A. de Quervain, V. Stefansson, etc.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, from November 30, 1913, to January 3, 1914. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 3624, Bay of Bengal.—Pig island to South Moskos islands, 3*s.* 54, Korea : Plans on the east coast of Korea : Port Lazaref and Yung hing bay, Won san chin (Gensan bay), Shimpo anchorage, Pohan bay, Fanjin bay, Tieyanha bay, Taajin bay, 3*s.* 2389, Australia, south coast : St. Vincent and Spencer gulfs, (Plan : Approaches to Port Adelaide), 3*s.* **New Editions**—1410, Wales : St. Govens head to New Quay (Plan : Port Cardigan), 3*s.* 2669, English Channel : The Channel islands and adjacent coast of France, 4*s.* 3038, Norway, west coast : Biörnsund to Kristiansund, 3*s.* 2556, France, north coast : Calais road, 2*s.* 2836*b*, Mediterranean : Archipelago—northern sheet. Plans : Foujes, Sandarli (Chandarli) harbour, Sighajik harbour, Vourlah harbour

Smyrna harbour, Port Sigri, Ports Mudros and Kondia, Port Ali Agha, Port Kolokithia, Dédé Agatch road, Rema bay, Kavala bay, Foggia Nova or Naes Foyes, 3s. 2734, China, Canton river: Si kiang or West river—Sheet 2: Sam chau to Chau sun, 3s. 961, Philippine islands: Basilan strait, 3s. 383, Australia, north coast: Thursday Island harbour, 2s. 105, Tasmania: Port Hobart, 3s. 1750, Australia, south coast: Port Adelaide, 3s. 2616, New Zealand, South island: Cape Foulwind to D'Urville island, including Tasman (Blind) and Golden (Massacre) bays (Plans: Tonga anchorage, Torrent bay and Astrolabe road), 3s. 1901, British Columbia: Plans in British Columbia: Holmes bay, McLaughlin bay, Carter bay, Kynumpt harbour, Goldstream harbour, Namu harbour, Safety cove (Oat-so-alis), Schooner Retreat (Ka-pi-lish), Stuart anchorage. Plan of Ogden channel and adjacent passages on this sheet erased. Plans added: Brundige inlet, Duncan bay and Metlakatla bay, Qlawdzeet anchorage. Refuge bay, 3s. 2449, British Columbia: Lama passage and Seaforth channel, 5s. 578, British Columbia, Vancouver island: Nanaimo harbour, 3s. 2512, British Columbia, Vancouver island: Approaches to Nanaimo harbour, 2s. 1412, West Indies, Curaçao island: Santa Ana harbour, 2s. 3688, Gulf of Mexico: Ports on the west coast of Florida: Approaches to Port Inglis. Charlotte harbour, 3s. 1148, West Indies, Puerto Rico island: Ponce harbour, Muertos island, 2s. 3570, West Indies, Puerto Rico: Yabucoa harbour, 2s.

(J. D. Potter, Agent.)

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, December, 1913. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, January, 1914. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean, January, 1914. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, January and February, 1914. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, January and February, 1914. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS AND SLIDES.

Asiatic Turkey—Mesopotamia. **Weber.**

Fifty lantern slides of Mesopotamia. *Presented by H. E. Weber, Esq.*

As will be judged from the titles, these slides are of interesting subjects, and form a useful addition to the Society's collection.

(1) Bas reliefs on the gate of Ishtar; (2) Walls of El Kasr; (3) Walls of El Kasr; (4) Excavations in El Kasr; (5) Excavations at northern end of El Kasr, showing lion; (6) Gateway to palace of Nabopalassar; (7) Pavement and foundations of Dais in Belshazzar's Banquet Hall; (8) White marble bas relief and inscription found at Babylon, Autumn 1910; (9) Shatt el Hilla and residence of German Archæologists; (10) Birs Nimrud, the temple pyramid of Borsippa; (11) Ramadi, the "Pylæ" of Xenophon; (12) Samarra, south gate of Malwia mosque, showing Shrine of the Imams; (13) Tower of El Kaim on south bank of Lower Head of Nahrwan canal; (14) Nahrwan canal, Katul el Kesrawi, near Kantara el Resasa; (15) El Ashikh, northern bastion of castle; (16) Harba, masonry bridge over Dijail canal built by al Mastansir, A.H. 629 (A.D. 1213); (17) Sidd Nimrud (so-called Median Wall) from Dijail; (18) Sidd Nimrud, remains of ancient fort at south end of rampart; (19) Remains of viaduct in bed of old Tigris near Akbara; (20) Akar Kuf to west (Dur Kurigalzu); (21) Eski Baghdad; (22) Tekrit, gateway to old

citadel; (23) Safera barrage built by Midhat Pasha across Sakhlawia branch; (24) Water flowing into the Habbania depression through breach in dyke at Ramadi in spring, 1911; (25) "Dahl" (pilot boat) on Euphrates; (26) Shakhtours on Euphrates; (27) "Kelek" (raft on inflated sheepskins) on Tigris; (28) Mesopotamian ploughs; (29) Peasant boy slinging stones to scare birds from maize-fields; (30) Treading corn; (31) Treading corn with a drag; (32) Khan Beni Said; (33) Courtyard of Khan Meshaida (Dijail), showing niches for lodging travellers; (34) Shrine of Aun near Kerbela; (35) Kerbela shrine of Hosain bin Ali; (36) Nejf (Meshed Ali) shrine of Ali bin Abu Talib; (37) Street in Khan Iskanderia; (38) Kut el Amara; (39) Kifl on Euphrates, tomb of Ezekiel; (40) Ruins at Nilia; (41) Ctesiphon, façade of Khosrees' palace, A.D. 1870; (42) Baghdad, panorama of left bank from the Serai; (43) Baghdad, customs house and bridge of boats; (44) Baghdad, Bab el Tilism; (45) Baghdad, Cenotaph of Sitt Zobeidah; (46) Kazimain, Shrine of Musa el Kazim and Mohamed el Taki; (47) Baghdad, waterside on left bank; (48) Hauling native sailing-boat (Sefina) through breach in old Hindia Barrage; (49) Ramadi, tent of Sheikh Faraj; (50) "Rahla" (march) of the tribe of the Anazeh Arabs, b. Hadhdhal in Shammia.

Dutch New Guinea. **Lorentz.**

Sixty-seven photographs of Dutch New Guinea, taken by H. A. Lorentz, Esq., LL.D. *Presented by H. A. Lorentz, Esq., LL.D.*

An important series of photographs of types of natives, native life, dwellings, etc., in a little-known part of the island. The titles are as follows:—

(1–6) Papuans from Humboldt bay; (7) Exterior of temple (Karri-warri), Humboldt bay; (8) Interior of temple (Karri-warri), Humboldt bay; (9) Papuans making rope, Humboldt bay; (10–11) Papuans from Humboldt bay; (12) Women and children; (13) Women in canoe, Lake Sentani; (14) Graves in Kampong Asé, Lake Sentani; (15) Making canoes, Lake Sentani; (16) Burning shells, Lake Sentani; (17) Beating bark for making cloth, Lake Sentani; (18) Dying bark-cloth, Lake Sentani; (19) Papuans in canoes on Lake Sentani; (20) Sawehs, mountain people north coast; (21) Nimboran men, north coast; (22) Nimboran women and children; (23) Kaptiau village; (24) Two men from Kaptiau; (25 and 26) Playing on the poly flute, Kaptiau; (27 and 28) People from Jende; (29) Canoe near Wakobi; (30) Siari village; (31) Grave on Mios Aifondi, Geelvink bay; (32) Merauke; (33) Village near Merauke; (34–39) People from Merauke; (40) Canoe on Merauke river; (41) Festivity house near Merauke; (42–45) Majoeb feasts near Merauke; (46) Pandanus growing along Lorentz river; (47) Palm trees, Lorentz river; (48) Screw pine, Lorentz river; (49) Village, Lorentz river; (50 and 51) Throwing chalk (ceremony), Lorentz river; (52–67) Papuans from the Lorentz river.

India. **Mellor.**

Thirteen slides of Rajputana made from photographs taken by E. W. Mellor, Esq. 1913. *Presented by E. W. Mellor, Esq.*

These lantern slides were made from photographs taken by Mr. Mellor during the spring of last year. They are clear, and, although perhaps more of archæological than geographical interest, will be useful for lecture purposes.

(1) Interior of dome of the first of the Dilwarra temples; (2 and 3) Interior of the second of the Dilwarra temples; (4) Pillars in the second of the Dilwarra temples; (5) The Arhai-din-ka-jhompra mosque at Ajmer; (6) South side of Juggernath temple at Udaipur; (7 and 8) Entrance to Juggernath temple at Udaipur; (9) Flight of steps at entrance to the Juggernath temple at Udaipur; (10 and 11) Royal cenotaphs at Udaipur; (12) Gateway of temple at Amber; (13) View of Amber.

N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

SIACHEN GLACIER SURVEY.

THEODOLITE STATIONS.

Station.	Latitude N.	Longitude E.	Height.
			feet
A	35° 28′ 02″	77° 05′ 08″	15993
B	35 29 07	77 04 26	17003
C	35 29 01	77 05 48	16946
D	35 29 21	77 02 37	16395
E	35 29 41	76 58 56	16314
F	35 30 45	77 01 27	16364
G	35 31 20	76 56 25	16765
H	35 33 13	76 55 22	17058
I	35 36 17	76 53 22	17450
J	35 38 17	76 50 05	17978
K	35 35 20	76 49 22	18222
L	35 35 43	76 48 43	18439
M	35 36 26	76 47 33	18780
N	35 38 06	76 45 43	20128
O	35 35 37	76 54 54	—
P	35 35 11	76 55 52	16980
Q	35 33 38	76 57 26	16736
R	35 32 19	76 58 09	16594
S	35 32 01	76 58 22	16559
T	35 29 51	77 00 57	16194
U	35 28 50	77 01 49	16002
V	35 26 59	77 05 01	15660
W	35 25 46	77 06 13	15503
X	35 29 57	77 12 13	17390
Y	35 29 58	77 09 05	17215
Z	35 20 20	77 11 38	14706

INTERSECTED POINTS.

			feet	
SIACHEN No. 1	35° 25′ 32″	77° 02′ 26″	19360	
,, 2	35 26 05	77 01 18	19460	
,, 3	35 23 04	76 57 26	20430	
,, 4	35 27 19	76 58 14	19620	
,, 5	35 28 08	76 59 48	16900	
,, 6	35 28 49	76 57 49	19560	
,, 7	35 29 41	76 52 59	21610	
,, 8	35 31 06	76 48 07	24280	Mt. Ghent
,, 9	35 31 44	76 48 33	24090	
,, 10	35 32 58	76 52 10	22160	The Hawk
,, 11	35 34 07	76 53 19	19960	
,, 12	35 34 31	76 50 44	19790	
,, 13	35 33 47	76 45 36	—	Silver Throne
,, 14	35 34 55	76 46 38	20230	Lower Silver Throne
,, 15	35 36 36	76 50 08	21440	
,, 16	35 37 59	76 47 29	23270	Mt. Hardinge
,, 17	35 39 51	76 45 43	24350	Queen Mary Peak
,, 18	35 39 55	76 50 33	21410	
,, 19	35 37 09	76 54 04	20770	
,, 20	35 35 47	76 57 32	22360	
,, 21	35 35 56	76 59 05	23630	Mt. Rose
,, 22	35 32 36	76 59 23	20300	
,, 23	35 36 02	77 03 00	24240	
,, 24	35 34 43	77 04 54	24510	Teram Kangri
,, 25	35 34 11	77 05 25	24300	
,, 26	35 33 08	77 08 16	22530	
,, 27	35 32 22	77 09 01	23770	
,, 28	35 31 57	77 08 40	23350	
,, 29	35 31 05	77 11 21	23010	
,, 30	35 29 48	77 14 39	22480	
,, 31	35 27 36	77 10 49	22910	Mt. Lakshmi
,, 32	35 27 29	77 07 55	21860	
,, 33	35 24 39	77 11 30	21580	
,, 34	35 20 33	77 08 14	20180	
,, 35	35 22 11	77 06 45	19530	
,, 36	35 22 04	77 04 47	20460	

GREAT TRIGONOMETRICAL SURVEY OF INDIA POINTS.

			feet
Pk. 23 / 52A ...	35° 43′ 30″	76° 41′ 46″	26470
Pk. 25 / 52A ...	35 36 44	76 34 23	25110
Pk. 26 / 52A ...	35 27 45	76 34 44	22750
Pk. 27 / 52A ...	35 25 08	76 33 12	23890
Pk. 33 / 52A ...	35 27 54	76 47 07	23960
Pk. 35 / 52A ...	35 24 24	76 50 50	25280
Pk. 36 / 52A ..	35 24 01	76 50 55	25400
Pk. 38 / 52A ...	35 12 12	76 45 41	21870
Pk. 9 / 52E ..	35 17 46	77 01 23	24570

76° 40′ 76° 50′

Pk 23 Hidden Pk 26470

Urdok Glacier

Indira Col

Turkestan La

Queen Mary Pk

King George V Group

Golden Throne

Sia La

Lower Silver Throne

Silver Throne Col

West Source Glacier

Silver Throne

Silver Throne Plateau

The Hawk 22160

Mt Gherat

Kaberi or Kondus Glacier

Kaberi Gl

Peak 36 Glacier

Shor-Pi-gang Glacier

Dong Dang Glacier

Bilaphond La

Alt. Bronze

Zogo

Mahori Glacier

Kor Kondus R.

Kor Kondus

Kurma Ding

Kondus River

Kondus

Bilaphond Glacier

Lolarb

The Siac

East

Fanny

Scale 1:

Reference.

...ck – Workman expedition
...ant Peterkin's survey party
...metrical Survey of India points
... based on triangulation
" " Indian Clinometer angles
" " Hypsometer readings

Area of Map

CHINESE EMPIRE

TIBET

Gartok

Lhasa

Brahmaputra

HIMALAYA MOUNTAINS

NEPAL

BHUTAN

Bareilly

Agra

Lucknow

Patna

Ganges

Allahabad

INDIA

Bengal

Calcutta

Scale 1:30,000,000

76° 50′

Published by the Royal Geographical Society

77°

NOTE.

The Siachen glacier and tributaries is from a trigonometrical survey by Mr. C. Grant Peterkin, surveyor of the expedition, assisted by Surjan Singh of the Survey of India, as plane-tabler.

The triangulation was carried out by Mr. Peterkin with a 5-inch transit theodolite, and is an extension of the fixed points of the Survey of India, checked by two bases deduced from the common side K¹⁰ K¹² ($\frac{G.28}{G.29}$ $\frac{G.8}{G.9}$) The methods by which the heights have been determined are stated in the reference. Topographical detail was filled in with the plane-table and from photographs taken at known points.

The northern slopes of Bride Peak, Golden Throne and Hidden Peak are from Sir Martin Conway's and the Duke of the Abruzzi's Surveys, 1892 & 1909.

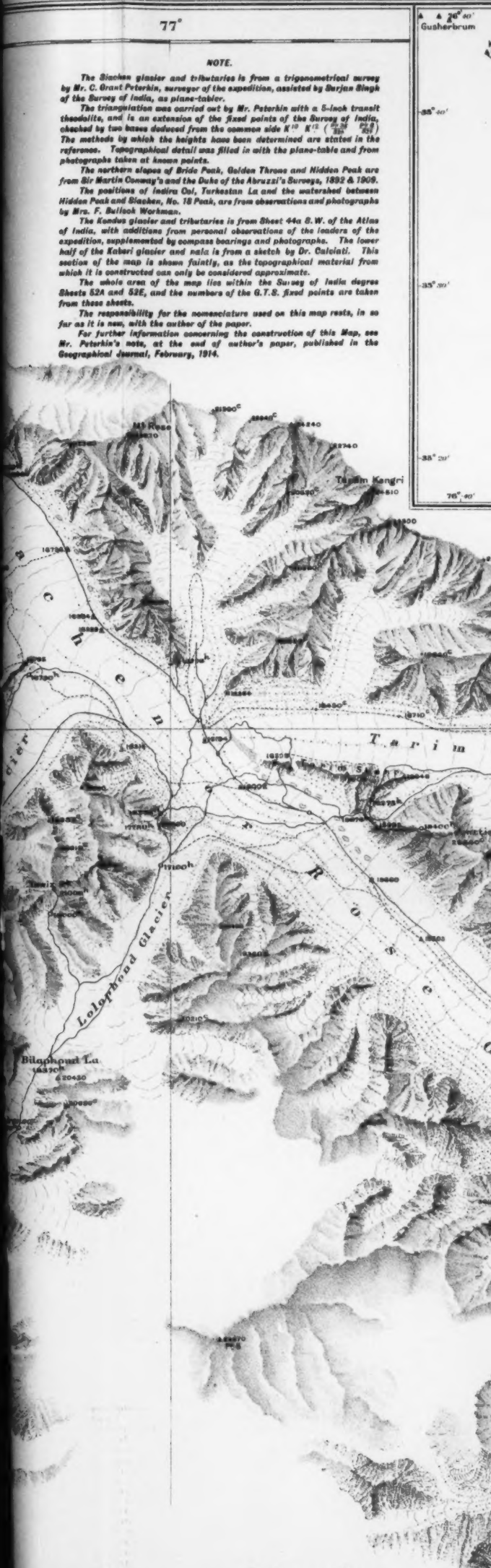
The positions of Indira Col, Turkestan La and the watershed between Hidden Peak and Siachen, No. 18 Peak, are from observations and photographs by Mrs. F. Bullock Workman.

The Kondus glacier and tributaries is from Sheet 44a S.W. of the Atlas of India, with additions from personal observations of the leaders of the expedition, supplemented by compass bearings and photographs. The lower half of the Kabari glacier and nala is from a sketch by Dr. Calciati. This section of the map is shown faintly, as the topographical material from which it is constructed can only be considered approximate.

The whole area of the map lies within the Survey of India degree Sheets 52A and 52E, and the numbers of the G.T.S. fixed points are taken from these sheets.

The responsibility for the nomenclature used on this map rests, in so far as it is new, with the author of the paper.

For further information concerning the construction of this Map, see Mr. Peterkin's note, at the end of author's paper, published in the Geographical Journal, February, 1914.



THE SIACHEN OR ROSE GLACIER

AND TRIBUTARIES

in the

EASTERN KARAKORAM

Explored by the

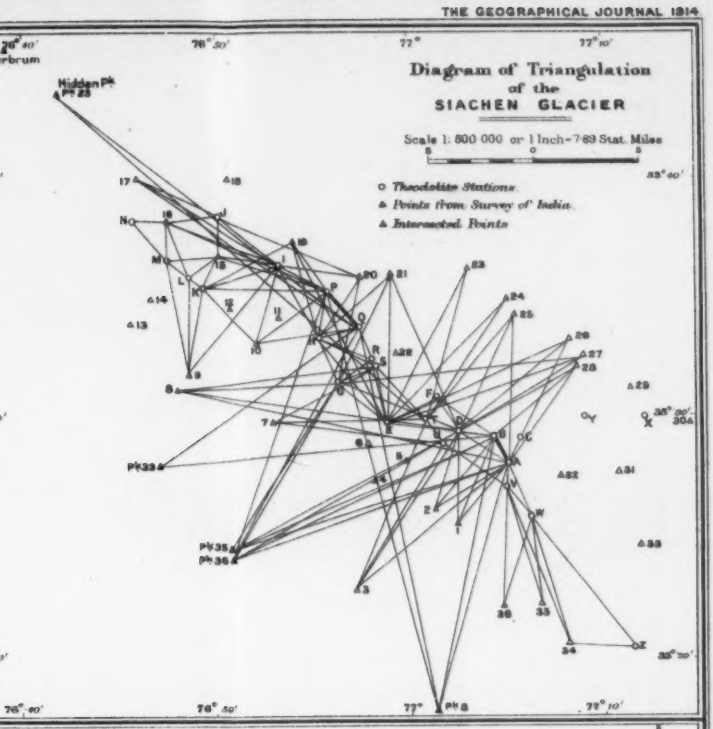
FANNY BULLOCK-WORKMAN EXPEDITION

1912.

Scale 1: 175,000 or 1 Inch = 2·76 Stat. Miles.

½ 0 1 2 3 4 5

77°



EASTERN KARAKORAM.
Bullock-Workman.

Sketch
to illustrate t
PROF. J.W. GREG
entit
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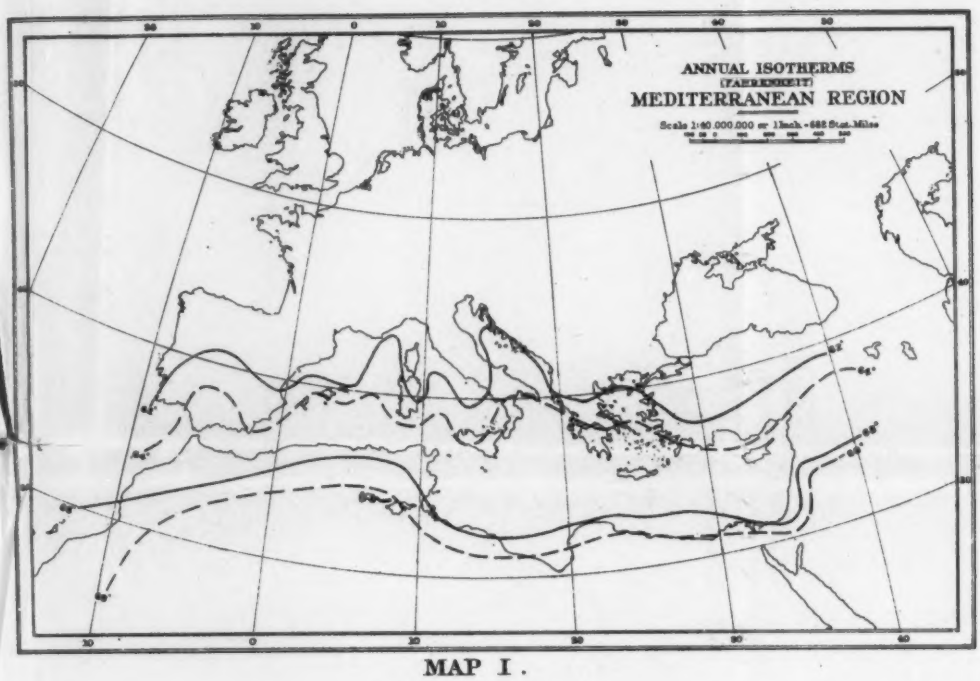

MAP I.

Map illustrati
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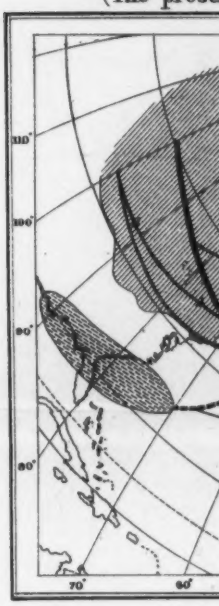
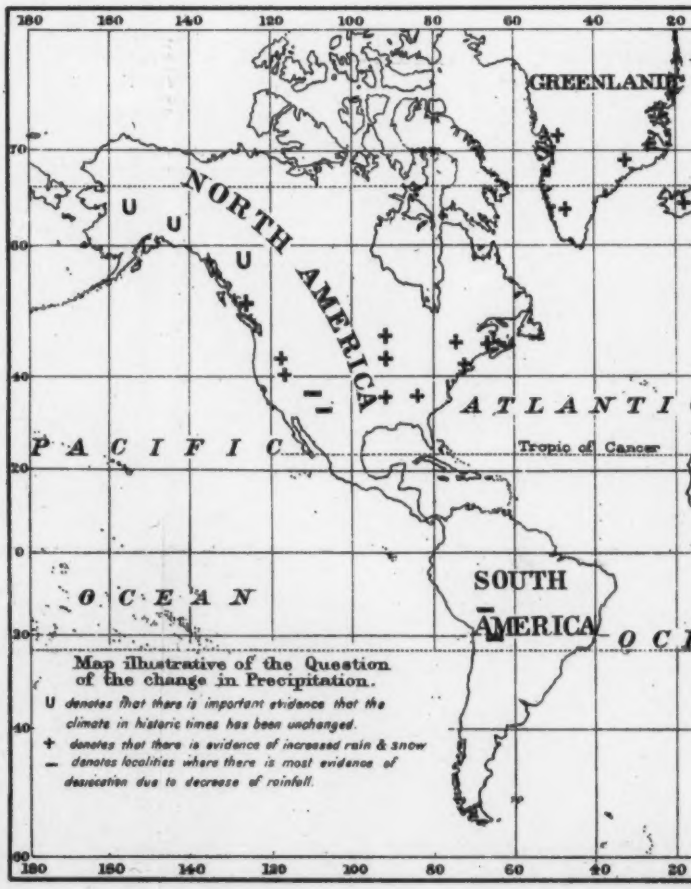
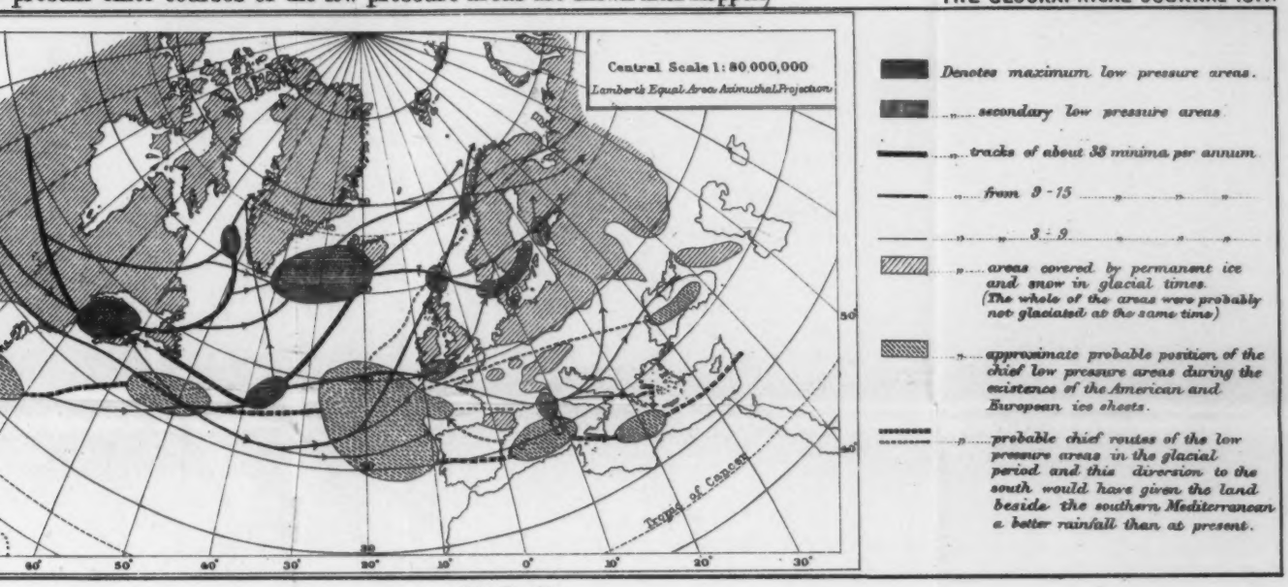



GREENLAND
NORTH AMERICA
ATLANTI
PACIFIC
Tropic of Cancer
OCEAN
SOUTH AMERICA
Map illustrative of the Question of the change in Precipitation.
U denotes that there is important evidence that the climate in historic times has been unchanged.
+ denotes that there is evidence of increased rain & snow
— denotes localities where there is most evidence of desiccation due to decrease of rainfall.

Publish

ketch Maps
trate the paper by
GREGORY, D.Sc., F.R.S.
entitled
EARTH DRYING UP"?

ustrating the Southern Position of the low pressure track in Glacial Times.
present chief courses of the low pressure areas are shown after Köppen)



Denotes maximum low pressure areas.
„ secondary low pressure areas
„ tracks of about 38 minima per annum
„ from 9 - 15 „ „ „
„ „ 3 - 9 „ „ „
„ areas covered by permanent ice and snow in glacial times. (The whole of the areas were probably not glaciated at the same time)
„ approximate probable position of the chief low pressure areas during the existence of the American and European ice sheets.
„ probable chief routes of the low pressure areas in the glacial period and this diversion to the south would have given the land beside the southern Mediterranean a better rainfall than at present.

MAP II.

MAP III.

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